THE ENGINEERING AND MINING JOURNAL

Historic Mines of Mexico.

BY F. J. H. MERRILL.*

With the constant increase of American investments in Mexican mines, there is a rapid growth of interest in all related matters. Many a ready pen is pressed into the service of the mining company or of the promoter, to tell, in glowing language, some story of old Spanish mines, once productive of millions, now long abandoned and forgotten and only awaiting the magic touch of northern capital to become again a flowing fountain of gold and silver.

As Wendell Phillips is said to have ascribed many of his bright thoughts to Socrates, so the writer of "boom literature" ascribes the record of legendary productivity to Alexander von Humboldt. This distinguished scientist and author published, in 1808, his "Essai Politique sur le Royaume de la Nouvelle Espagne"; it has been published in French, German and Spanish; and was translated into English. In the eleventh chapter of this work, Humboldt discusses at some length the statistics of the mines which were actively operated at that time. As this chapter has not been printed in English since 1811, it may be of interest to give an abstract of the information therein contained in order to show how far the Baron was responsible for some of the statements attributed to him.

At the time mentioned, according to Humboldt's map, "New Spain" extended northward to Tucson, Arizona, and eastward to the vicinity of Lake Charles, Louisiana, and was divided into 12 *intendencias*. These, in turn, were divided into 37 mineral districts, or *disputaciones de minera*. These included about 500 mining camps (*reales* or *realitos*), comprising about 3,000 mines. The intendencias no longer exist, but have been divided up and rearranged into the present series of States.

Humboldt gives a long list of the principal mining camps, or *reales*, but it is not advisable to print it here, as there is no map accessible on which all of these places are located. This is due to the imperfect character of Mexican maps in general, and to the fact that many of these camps no longer excite interest. There is the additional difficulty of the change of names. In many instances names have been abbreviated, especially the long mission names. Thus San Ildefonso de la Cienguilla, in Sonora, is now Cienega. In other cases names have been completely changed, as Pitic to Hermosillo.

The period of Spanish activity in working the mines of Mexico occurred between the conquest by Cortez, in 1521, and the war for Mexican independence, which began in 1810. The earliest deposits worked by Spaniards were those of Tasco, Sultepec, Tlapupahua and Pachuca. The statistics of production quoted by Humboldt are those of the Spanish authorities; these may be regarded as reasonably accurate records of the mines which produced large revenues. The distinguished author gives statistics of 8 groups of mines which were especially productive in his time, namely:

	Annual production silver marks.
1. Guanajuato, San Luis Potosi, Charcas, Catorce, Zacatecas, Fresnillo, Sombrerete, Asientos de Ibarra	1,300,000
2. Guarisamey (Durango), Rosario, Copala, Cosala	400,000
3. Parral, Cosiquiriachi, Batopilas	Undetermined
4. Pachuca. Real del Monte	120,000
5. Zimapan, Doctor	60,000
6. Bolanos	230,000
7. Tasco, Temascaltepec, Zacualpan	260,000
8. Oaxaca, Villa Alta	Not given
Estimated total	2,500,000

The silver mark was a weight of 3,548 grs. troy; but, taking it at 8 oz. troy for rapid calculation, the annual production from these eight camps would have been 20,000,000 troy oz. of silver, or (at 60c. per oz. of silver) $12,000,000.

The 13 richest or most productive camps in the order of output for 1804 are given by Humboldt as follows:

	State.
Guanajuato	Guanajuato
Catorce	San Luis Potosi
Zacatecas	Zacatecas
Real del Monte	Hidalgo
Bolanos	Jalisco
Guarisamey	Durango
Sombrerete	Zacatecas
Tasco	Guerrero
Batopilas	Chihuahua
Zimapan	Hidalgo
Fresnillo	Zacatecas
Ramos	San Luis Potosi
Parral	Chihuahua

As the first table shows, from only a few mines was drawn the 20,000,000 oz. of silver annually; this was shipped to Europe and Asia through the ports of Vera Cruz and Acapulco. Guanajuato, Zacatecas and Catorce yielded more than one-half of the sum. Guanajuato alone yielded nearly one-fourth of all the Mexican silver and one-sixth of the total product of America. From 1785 to 1789 the following sums entered the royal coffers of Spain from 11 provincial treasuries:

	Silver Marks.
Guanajuato	2,469,000
San Luis Potosi (Catorce, Charcas and S. L. Potosi)	1,515,000
Zacatecas (Zacatecas, Fresnillo, Sierra de Pinos)	1,205,000
Mexico (Tasco, Zacualpa and Sultepec)	1,055,000
Durango (Chihuahua, Parral, Guarisamey, Cosiqui)	922,000
Rosario (Rosario, Casala, Copala, Alamos)	688,000
Guadalajara (Hostotipaquillo, Asientos de Ibarra	509,000
Pachuca (Real del Monte, Moran)	455,000
Bolanos	364,000
Sombrerete	320,000
Zimapan	248,000
Total in silver, marks	9,730,000
" " troy oz	77,840,000
" " U. S. currency	$46,904,000

Humboldt gives no statistics concerning gold mines, but says that the gold of Mexico is chiefly derived from placers and is abundant in Sonora, where it has been found in nuggets of several pounds weight. He speaks of the precious metal in the sands of the Yaqui river, and in the region known as Pimeria Alta, now the Altar district. Concerning this territory, he remarks that the mining of the gold is hampered by attacks of savage Indians, by the high cost of food, and by the scarcity of water for gold washing. The rest of the gold comes from veins which are most frequent in Oaxaca.

From this it may be seen that the mining camps mentioned by Humboldt as specially productive, are all known at the present day.

So-called *antigua* workings, long abandoned, exist abundantly in many States of Mexico; many of these when developed by modern engineering skill have yielded rich returns; but, as a rule, these workings were abandoned because the local methods could not make them pay. Sometimes the ore has been worked out of a single shoot and the mine then abandoned; sometimes a change in mineral character has rendered previous metallurgical processes inapplicable; sometimes the flow of water has gone beyond the resources of the native. In the absence of complete evidence, it is not to be denied that there may be records extant of rich mines whose location is unknown, but apparently those records should not be attributed to Alexander von Humboldt.

*Consulting geologist, New York.

The Fatigue of Material.

Regarding the crystallization or "fatigue of material" of wrought-iron, J. O. Arnold, in *Engineer* (1905, No. 100, p. 158), remarks that Sorby, in 1863, put forward the view that the polyhedral and rounded figures presented by wrought iron under the microscope are due to the interference of cubic and octahedral crystals. Direct evidence of cleavage parallel to the face of the cube has, however, been wanting up to the present. Arnold has recently examined the end of a wrought-iron bolt which had broken after being in use for 30 years. The metal contained:—combined carbon, 0.047%; silicon, 0.157%; manganese, 0.096%; sulphur, 0.020%; and phosphorus, 0.350%. It was thus an inferior wrought iron, the greater portion of the phosphorus not being contained in the involved slag, but in combination with the iron proper. On examining the fracture under the microscope, it was observed that one of the crystals of iron had broken at right angles to the axis of the bolt. When the fracture was cut off in the lathe and mounted for examination, the fractured face of this crystal was exactly at right angles to the axis of the microscope, and it was seen that the crystal exhibited perfect cleavages parallel with the faces of the cube. These crystals, of course, were developed by jar and strain, and resulted in a fatigue of material.

Electrical Reduction of Vanadium.

Gustave Gin, the well-known French chemist, has introduced an improved method of producing metallic vanadium and alloys of vanadium and copper in an electric furnace. The process is based upon the great conductivity of the vanadium trioxide, and on the readiness with which trifluoride of vanadium is produced when the vanadium trioxide is exposed to the action of fluorine in the presence of carbon. In carrying out the process, "sesquifluoride" of iron, dissolved in molten calcium fluoride, is electrolyzed, employing an anode formed of an intimate mixture of trioxide of vanadium blended with carbon; the cathode consists of a bath of metallic iron. The iron fluoride, on being decomposed by the electric current, causes fluorine to be liberated on the anode. This attacks the vanadium trioxide, which yields its oxygen to the carbon and is converted into trifluoride of vanadium; this dissolves in the fluoride of calcium, and is in turn electrolyzed. The vanadium set free combines with the metallic iron serving as the cathode, and the fluorine that is evolved from the anode combines to form a fresh quantlty of fluoride of vanadium, which is again electrolyzed. As the result of these operations, the original charge of ferric fluoride does duty in starting the reaction and in providing the requisite fluorine needed to effect the transfer of the vanadium from the anode to the cathode. The cathode of the furnace consists of a block of steel. For alloys of vanadium with metals other than iron, the bath of iron serving as the cathode is replaced by one composed of the metal it is desired to alloy with the vanadium.

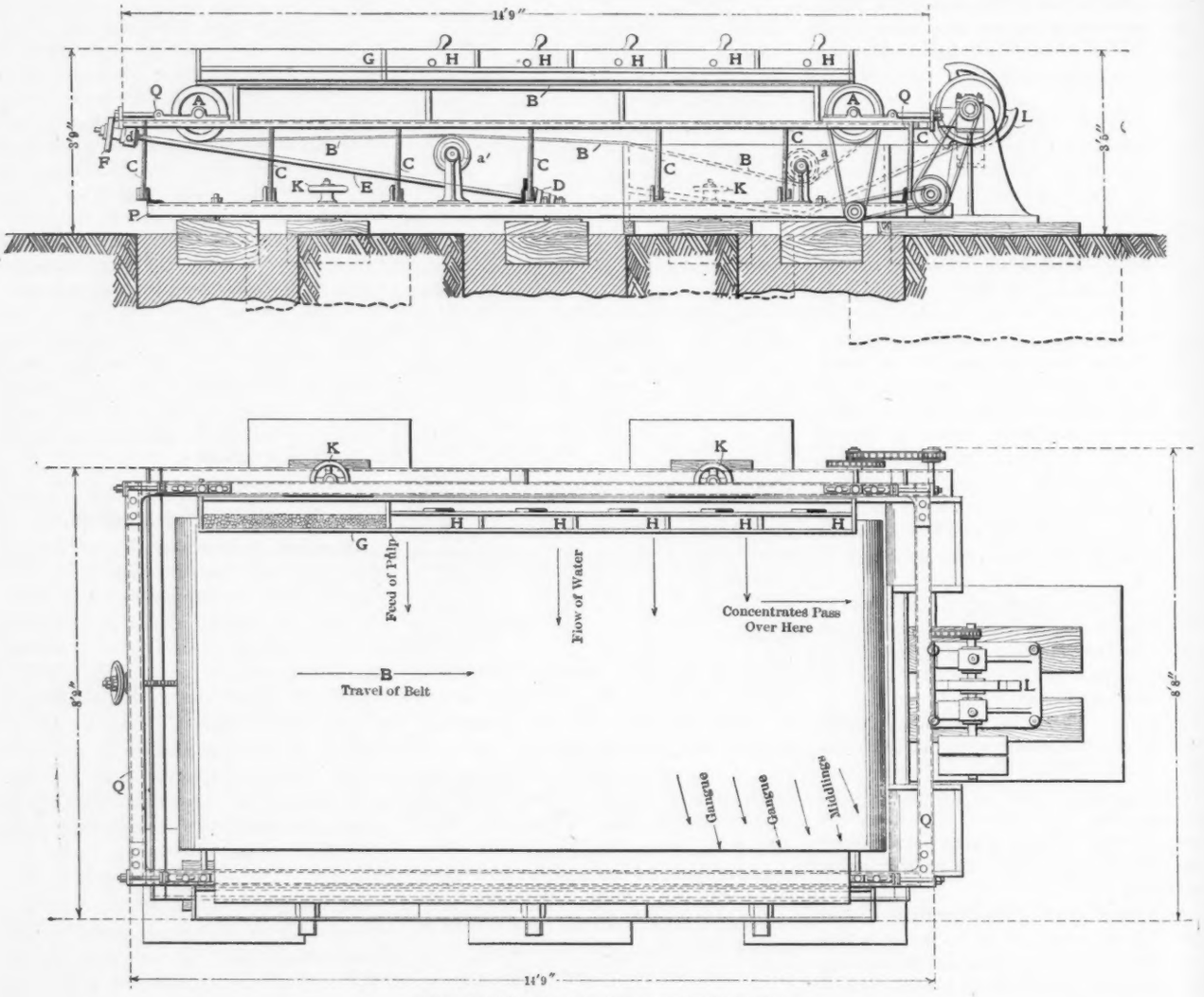
The Buss Slimer.

BY EDWARD WALKER.

The new slime table, described and illustrated herewith, was invented by Dr. Julius Buss, and is made by the Luhrig Company, of London. It is intended for trating any ore or tailing between, say, 50-mesh linear and the finest powder that settles in water.

An inclined traveling belt *B* (moving from left to right in the diagrams) passes round rollers *A*, which are mounted on a frame *Q* This frame is supported on inclined wooden springs *C*, the lower ends of which are fixed to the lower frame *P*, The frame *Q* is held up against a cam-wheel *L*, by means of the rod *E*, which fits at one end in the socket *D*, on the lower frame *P*, and passes through another socket *d*, on the upper frame *Q*. This rod can be lengthened or shortened by turning the wheel *F*, at its top end; and thus the pressure of the frame *Q*, against the wheel *L* may be varied.

The rotation of the wheel *L* imparts a longitudinal shock to the belt. This shock occurs at a rate of four to six times per



BUSS SLIMER, PLAN AND SIDE ELEVATION.

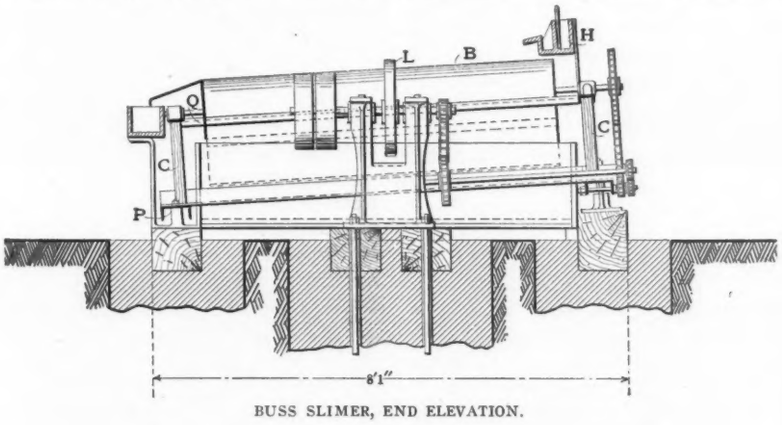
Cadmium is now rather extensively used in the manufacture of sterling silver, being added as a deoxidant. It is customary to introduce 0.5% cadmium for that purpose. The cadmium also renders the silver sound and the metal rolls well.

The ton-mile is the usual measure of the work done by railways in transporting freight. The average rate of receipts per ton-mile is the best practicable measure of the general level of railway charges, and is used largely for cartage costs as well.

second; and, on most slimers, it is of an exceedingly gentle nature. The magnitude of the shock can be increased or diminished by shortening or lengthening the rod *E*.

The belt is made of comparatively smooth canvass, with just enough grip to hold the heavier particles. The slime is fed through *G;* the water comes out of the troughs *H* and runs down across the belt. The heaviest particles hardly travel down the belt at all, but pass over (as shown at the right-hand end of the diagram); while the middling and gangue pass off in the way indicated. After passing round the end roller, the belt goes down underneath a roller *a*, and passes through a tank of water. Here the concentrate is washed off by the help of the "knock" of the belt.

According to the nature of the ore, it is necessary to decide how much of the middling is to be recovered with the concentrate. This is regulated by varying the strength of the knock, and the height of the upper side of the belt. In some cases it is useful to have sprays of water (as shown at the lower part of the right hand side of the belt), so as to wash some of the middling over the side of the belt and not let it pass over the end and into the tank with the concentrate.



BUSS SLIMER, END ELEVATION.

The cam wheel is driven by a small engine; the rollers round which the belt passes are driven by means of sprocket wheels from the shaft of the cam wheel.

In connection with the table an interesting point is that, owing to the gentleness of the knock, it is not necessary to make the foundation unusually strong. In fact, it is not even necessary to bolt the lower frame to the foundation blocks. For the same reason, but little power is required to run the machine. The advantage of the wooden springs was explained in the article on the Buss swinging table (see this JOURNAL, Aug. 4, 1904). The method of delivering the water to the belt also follows that adopted in the swinging table.

In the drawings the belt is shown horizontal, but it often happens that it is advantageous to have the right-hand end, as shown in the illustration, higher than the left-hand end, and also to still further elevate the right-hand top corner. These alterations may be easily made by means of the screws *K*.

The belt is not supported by a series of rollers (as is often the case with traveling belts), but by a series of angle irons fixed diagonally to the frame *Q* In this way a more even surface is obtained; and there does not appear to be any appreciable wear of the lower side of the belt.

Improvements in Nickel-Copper Separation.

Ambrose Monell, of New York, has described an improvement in the method of separating nickel and copper sulphides, as practiced at the Orford works (U. S. patent, No. 802,012, Oct. 17, 1905). The following, which is taken from the specification of the patent, reviews the previous state of the art, and outlines the improvement:

In the reduction of ores containing nickel and copper where a matte is produced containing sulphides of nickel, copper and iron, a process has been devised in which a separation of the nickel sulphides is effected by the use of sodium sulphide, advantage being taken of its power of dissolving the sulphides of copper and iron freely and forming a solution of less specific gravity than the nickel sulphide. The matte mixed with coke and sulphate of sodium has been charged into a cupola-furnace. When this charge is smelted, the sodium sulphate is reduced by the coke to sodium sulphide and, forming a solution with part of the copper sulphide and iron sulphide, flows with the undissolved and melted sulphides of nickel, copper, etc., through the tap-hole, which is kept constantly open, into molds, where the molten constituents separate in accordance with their specific gravity, the sodium sulphide containing the dissolved copper and iron sulphides floating on the surface and the undissolved sulphides settling to the bottom. When the contents of the mold have solidified, the parts are separated by fracture, and the tops containing the copper and iron are recharged into a smelting-furnace, where the sodium sulphide is fluxed off in an iron slag, being then lost. The bottoms contain most of the nickel sulphide of the original matte; but owing to the imperfection of the separation they also contain so much copper sulphide and iron sulphide that it is necessary to resmelt them with fresh additions of coke and sodium sulphate, and thus to repeat the smelting and separation to the fourth or fifth time before the bottoms are brought to sufficient degree of freedom from iron and copper to enable the resultant nickel sulphide to be economically subjected to the succeeding steps of the refining process. The process as thus carried on is slow and wasteful and because of the cost of materials and the amount of labor and handling required adds greatly to the expense of the nickel or nickel oxide which are the final products. These difficulties are overcome by the following process:

Instead of smelting the compound matte, as heretofore in a cupola-furnace and running the product continuously into molds, the matte is so smelted that it will remain in a molten state subject to the high temperature of a furnace for a considerable period of time, during which the copper and iron sulphides are thoroughly dissolved by the sodium sulphides, and in one melting a good separation can be effected; and by two such treatments results are obtained equal or superior to the results of the four or five meltings which have been employed heretofore. The smelting-furnace employed for this purpose is an open hearth reverberatory, lined with magnesite brick; silica linings are quickly destroyed by fluxing with the sodium sulphide. A charge of nickel-copper-iron matte, either solid or molten, is mixed with coke and sodium sulphate, the latter being preferably present in the proportion of 60% of the weight of the matte and the coke in the proportion of 15% of the matte. The sulphate is preferably added in the form of commercial niter-cake. Where, for example, a 50-ton charge of matte is treated containing, say, 45% of nickel sulphide and 35% of copper sulphide, it is melted in the furnace and retained subject to the heat for four to five hours after fusion has occurred, during which time it is preferably "poled," *i. e*, treated by immersing beneath its surface poles of green wood, which facilitates and renders more thorough the solution of the sulphides to be removed. Nearly complete solution of the copper and iron sulphdes in the sodium sulphides reduced from the niter-cake is thus effected, and the molten charge may be tapped from the furnace and allowed to separate in molds; but to get the best results, the different strata are tapped from the furnace separately, tapping first the solution of copper and iron sulphides floating on the surface of the bath, and finally tapping the undissolved nickel sulphide, or the order

of tapping may be reversed, the lower stratum of nickel sulphide being removed first. The great proportion of the iron and copper is thus separated, the nickel sulphide obtained being nearly pure. Where greater purity is desired, the nickel sulphide may be recharged into the furnace and treated again in like manner.

Robert R. Maffett, of Bayonne, N. J., describes a new method of treating copper tops in the refining of nickel-copper matte in U. S. patent No. 802,148, Oct. 17, 1905. He takes the copper-iron tops from the nickel cupolas and piles them, preferably in a heap of about 3 ft. deep, in the open, where the action of the weather oxidizes the sodium sulphide to sodium sulphate. These tops are allowed to weather about eight weeks, the greater part of the sodium sulphide in the tops being oxidized to sodium sulphate, which is easily separated from the copper sulphide and nickel sulphide contained in the tops. As soon as the tops which have been treated in this manner are smelted, the sodium sulphate rises to the top of the charg and is drawn off into pots, when it is allowed to cool and is returned to the nickel cupolas, where it is used in place of refined saltcake. The conversion of the sodium sulphide to sodium sulphate is completed by oxidation, which is effected, preferably, by an air-blast, and the oxidation is continued until all or nearly all of the sodium sulphide is converted into sulphate, which in a coal-fired reverberatory furnace containing, say, 25 tons of the tops may last 12 hours after the fusing of the charge; but the time will vary with the heating capacity of the furnace and the rapidity of the oxidation. When the conversion of the sodium compound to sodium sulphate has been completed, the molten contents of the furnace may be withdrawn together into pots or molds, when they will separate by gravity with a clean sharply-defined separation into a floating stratum of sodium sulphate, a bottom stratum of copper sulphide carrying a small percentage of nickel sulphide, and an intermediate stratum of iron silicate which may carry about 3% of copper and 1.5% of nickel in the form of oxides. While the stratified and congealed mass is cooling and before it has entirely chilled, the layers can readily be separated from each other by tapping with a hammer. The top layer, consisting of sodium sulphate, carrying a little copper and nickel, can be used again in the separation of matte, the iron layer can be charged directly into a smelting-furnace, and the bottom layer of copper sulphide, being nearly free from iron, can be refined in a reverberatory furnace without need of previous calcination.

Instead of tapping the molten products of the separating-furnace together and allowing them to separate in pots or molds, as described above, advantage may be taken of their stratification while in the furnace and the layers can be tapped separately into different vessels, since in this way a more complete separation and purer prdoucts can be obtained. By skimming or tapping off the floating layer of sodium sulphate and iron silicate and leaving the copper sulphide remaining in the furnace, the further refining of the copper may be, if desired, directly continued in the same furnace.

New Mining Regulations in Chihuahua, Mexico.

The State government has recently promulgated new regulations covering the taxation of ores and methods. They are substantially these:

1. The value of metals shall be the basis of all taxes.

2. Silver and gold in bars or bulk pay 1.5% of their value.

3. When gold and silver are brought to the Federal assay office in that capital, the payment of taxes shall be made to the State treasurer; otherwise to the tax office of the district whence it came.

4. When the exact value of the gold or silver is not known, the owners can make bond or deposit to the satisfaction of the tax collector, together with a manifest of the number of bars, exact weight, and approximate value.

5. When gold and silver are taken from the place of production without compliance with the foregoing articles, such violations are punishable as provided in the *ley de hacienda.*

6. Ores and metals extracted for reduction in or out of the State for exportation will be taxed on the total value according to the testing works' liquidations. Included in this valuation are all metals which pay charges according to article 120 of the law of *hacienda.*

7. Owners or managers before shipping will make a manifest of the exact weight and approximate value before the metals or ores will be allowed to be shipped, and the tax office will be guaranteed the tax by bon or deposit.

8. As soon as the interested parties receive their liquidations they shall present themselves at the tax office to pay the metal tax according to these regulations.

9. By the total value of the metals must be understood the commercial value of the metals at the smelters and buying agencies.

10. The State executive will accept *igualas* for imports on metals when asked for on the following basis: (1) 1½% when the value of the metals contained is $50 or over per ton; (2) 1⅜% when the value is $40 and less than $50 per ton; (3) 1¼% when $30 and less than $40 per ton; (4) 1% when the values are less than $30 per ton.

11. Crushed ores and concentrates will be taxed 1% of their metallic value.

12. To procure an iguala it will be necessary to make a bond to the State treasurer to the value per year of the tax.

13. Having procured a bond, the recipient thereof will make manifestations and pay the tax in conformity with article 9 hereof.

14. The agencies of reduction plants and the offices of metals-buying agencies are obliged to make monthly statements to the tax office in the districts in which they are located. These must state to where the consignments are made, the value of the metals in dollars, and the name of the owners. Under any violation of this rule, the ores will not be permitted to be transported.

15. Any violation of these rules will be punishable under the law of *hacienda* pertaining to this subject.

Iron Industry in South Africa.

Americans, under the title of "The Transvaal Iron and Steel Company," are attempting to develop an iron and steel industry at Zurfontein, midway between Pretoria and Johannesburg, on the South African railroad.* A large ore deposit has been acquired which will be utilized in the manufacture of steel rails, provided that a supply of suitable coke can be obtained; that now derived from Natal is not satisfactory. For the present the company will confine itself to the making of bar and angle iron, small rails and light pieces from iron and steel scrap, a 5-year supply of which has been optioned from the surrounding mines at prices in no case exceeding $5 per ton. The high price of imported material, paying ocean freights of $6 to $7.50 and railroad rates of $25 to $28 per ton, offers the best inducements to the new enterprise.

It is proposed to build a $100,000 plant, capable of turning out 20 tons per 10 hours which will comprise 9-in. and 14-in. rolling mills, a plate mill and a sheet mill with accessory galvanizing and corrugating machinery. A Siemens-Martin furnace and a steam-hammer forging shop will complete the plant.

According to W. Hoettger (French Patent 352,615, March 22, 1905), wood, especially that destined for use in mines, should be impregnated with a hot solution of a silico-fluoride (fluo-silicate); for example, with a ½ to 1% solution of sodium or zinc silico-fluoride. On cooling, the greater part of the salt crystallizes out in the pores of the wood, preserving it and rendering it non-inflammable.

The first use of naturaly hydraulic cement in the United States was in 1818, when Canvass White used it in construction work on the Erie canal in the State of New York.

*Daily Consular Report No. 2427, Dec. 2, 1905.

Structure of Electro-Copper.*

BY A. K. HUNTINGTON.†

The illustrations given herewith elucidate the reason why a spiral scratch or groove on a mandrel causes the copper deposited on it to part easily, so that a long ribbon may be obtained.

My explanation of this phenomena is that the direction of the lines of crystallization of an electro-deposited metal are the same as in a casting made on surfaces having the same inclination; that is, the crystals form at right angles to the surface on which the deposit or the casting is made. It follows that when the crystals which form on surfaces more or less at an angle to one another meet, there will be want of continuity between the two sets of crystals, because a line of weakness will have been developed.

To make this clear, I have had a piece of copper deposit (for making wire) polished and etched (with nitric acid in alcohol) (Fig. 1). In order to polish the strip without rounding the edges, I had white metal cast round it. The effect the groove on the mandril has on the direction of the crystals of the deposit is clearly shown. There is, in fact, a complete break in the continuity of the metal. To compare with this, I have photographed a casting composed of 50% copper and 50% zinc (Fig. 2). The crystals from the opposite long sides (which must be approximately parallel) do not even then merge one into the other, but show a break. There examples, among other things, point to the importance of avoiding sharp angles in castings and deposits when strength, and not rupture, is aimed at.

*Abstract of a paper read at the Faraday Society, Oct. 31, 1905.

†Professor of Metallurgy, Kings College, London, Eng.

Photo-micrographs of a cathode plate which has been deposited on a thin strip of electro-deposited copper are shown in Fig. 3 and 4. In some cases the crystals of the original strip have been continued in the cathode plate. This was the side of the strip which had not been in contact with the surface on which the strip was deposited, and thus had a clean crystalline face. The way the crystals follow the curvature of the strip is very apparent.

Another photo-micrograph (Fig. 5) illustrates what happens when the electro-deposited copper is annealed. The long crystals of the deposit are completely broken up and become largely twinned.

We learn that brittleness which is due to the direction in which crystals form in castings and electro-deposits, may be modified and probably completely removed by suitable annealing. This, however, would be the case only when there is a line of weakness and the continuity is not entirely broken; otherwise the unequal expansion caused by the heat would make matters worse rather than better.

I may be wrong, but I am under the impression that these are almost the first good photo-micrographs of electro-deposited copper which have been published.

FIG. 1.

FIG. 3.

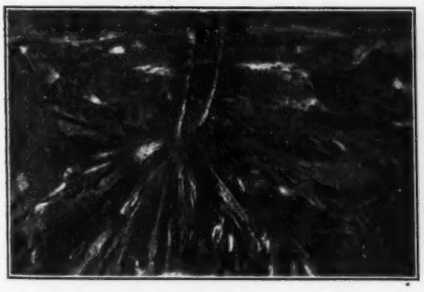


FIG. 2.

FIG. 4.

FIG. 5.

Brazilian Monazite.

A concentrating plant for treating the monazite-bearing sand of the Parahyba river has been erected at Lage, 3 miles from Sapucai, in the State of Rio de Janeiro. This is the fourth attempt in Brazil to treat monazite sand mechanically on a large scale. The proprietor expects to be able to treat a sand containing only 2% monazite and recover a product, worth $135 per ton, at the rate of 50 tons per month. At present the market is controlled by monopolists along the ocean shore.

An Oregon Electric Power Plant.

BY OUR SPECIAL CORRESPONDENT.

The Baker Light & Power Company recently put into commission a large power-house in Baker county, Oregon. It is 25 miles west of Baker City, in Rock Creek cañon, 4,400 ft. above the sea, is 30 by 60 ft. inside measurement, and has an output of 900 kilowatts. Two generators, each operated by a Pelton wheel, two exciters, three 300-k.w. step-up transformers, switchboards and a private telephone line comprise the equipment. Current is generated at 2,300 volts, and transmitted over bare copper at 23,000 volts.

The wheels are operated by water from Rock creek under 940 ft. head. It is taken some three miles up the cañon. From the dam in the creek a flume 1¾ miles long carries the water to the penstock, which is 2,600 ft. long. The penstock is 26 in. diameter, reduced to 14 in. diameter at the power-house.

The transmission line is now nearly completed. The last section is about 20 miles over the 9,000 ft. elevation into the Bourne mining camp, and will have a total length of 50 miles. The wire used is No. 4 copper; one section runs through Baker City, 30 miles to the Emma mine, which lies 7 miles east of Baker. Another section runs to Baker City. The third section runs 8 miles to the United Elkhorn mines, and still another connects with the town of Haines, 12 miles away. The new section just being finished supplies the Bourne camp. The Emma mine, the United Elkhorn, the Eureka & Excelsior, North Pole, Columbia, Golconda and Tabor Fraction are all in the territory served by this plant; the first two already use current from it.

Besides the hydro-electric power plant on Rock creek, the same company has a large steam plant at South Baker, 1½ miles from Baker City, as an adjunct to its water-power plant. Here are installed two water-tube boilers of 350 h.p. each, a Nordberg engine of 750 h.p., two 200-k.w. three-phase, 60-cycle generators, operating at 2,300 volts, and two 200-k.w. transformers.

Electrolytic Versus Sulphuric Parting of Bullion.*

BY F. D. EASTERBROOKS.†

The essential elements of a parting process are: (1) The production of silver at a low cost equal to the strictest commercial requirements, free from gold; and (2) operating with great neatness. These conditions are more easily attained with electrolytic than with sulphuric-acid parting, although at the present time the larger portion of the bullion produced by the lead and copper refineries is parted by the latter method. Electrolytic parting processes have not as yet been generally adopted.

The purpose of this paper is to point out some of the principal characteristics of the several parting methods.

With the sulphuric-acid method, refined gold can be produced, ready for shipment, 24 to 30 hours after placing the bullion in the kettles, which is several days earlier than is possible with an electrolytic method. This is advantageous in those cases where the ore is high-grade and interest charges have to be considered. A daily cut-off of the gold treated can be made, and thus a quick check obtained of output on input. There is also almost no silver tied up in plant, as in the electrolyte and cathodes of an electrolytic process.

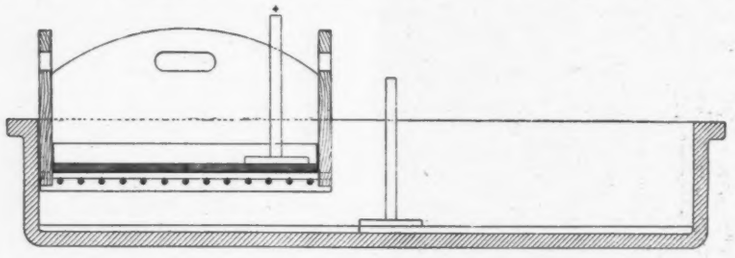


FIG. I.

The acid solution from the reducing tank containing the copper used to reduce the silver-sulphate solution is disposed of in either of two ways: the bluestone crystallized on lead strips and the mother liquor concentrated and used again in the kettles, or, as is the case in copper refineries, added directly to the electrolyte, in which case the value of the acid added per ounce of silver parted, after deducting the power cost of depositing the copper in insoluble anode tanks, determines the amount at which an electrolytic parting process must operate below the sulphuric in order not to exceed the costs of the latter, since with an electrolytic parting process sulphuric acid must be bought especially for the copper electrolyte.

There is a loss of acid at the kettles while dissolving silver in sulphuric acid. This loss depends partly upon the rate at which the process is conducted, and partly on the efficiency of the condensing apparatus, but in any case amounts to a considerable precentage of the amount used.

Another objection to the acid method is the non-elimination of tellurium from the silver during parting. This element materially affects the physical properties of the silver with which it is alloyed, small quantities causing it to crack at the edges while being rolled.

In minting operations, the fine silver is first alloyed with 10% copper. One part per thousand of tellurium in the silver will cause this alloy to crack when rolled out, so that .05 to .06% is the probable safe maximum amount of tellurium that can be present in silver and meet the strictest requirements. To produce silver from material containing much tellurium, so that the refined product will not contain more than the above maximum allowable amount, requires, when parting with sulphuric acid, an exposure of the bullion in the cupel to air and niter for a considerable length of time.

The usual quantity of slime was melted in a cupel furnace. After skimming the slag, two tuyere pipes 2 in. in diameter were placed so that air under 5 oz. pressure blew directly on the surface of the bullion. Niter was used freely. Twelve and one-half hours was required to eliminate sufficient tellurium to secure a refined product of the requisite fineness. The analyses of the several samples are given in Table I, which shows also the early removal of the selenium.

This bullion was parted with sulphuric acid, and the refined silver contained 0.6 part of tellurium. A portion of the same lot parted electrolytically contained not a trace.

TABLE I. ELIMINATION OF TELLURIUM AND SELENIUM. CHARGE NO. 5.

Time Taken.				Parts Fineness.			
				Te.	Se.	Ag.	Au.
Sample	A	April 8,	5.00 a. m.	34.30	13.45	903.72	15.98
"	B	"	9.00 a. m.	23.40	.81	939.47	16.53
"	C	"	1.00 p. m.	5.36		968.61	17.19
"	D	"	3.00 p. m.	2.41		973.35	17.25
"	E	"	5.30 p. m.	1.31		973.46	17.04

With electrolytic parting we have a choice of two distinct systems of depositing silver on the cathode, one in a loose crystalline form at a relatively high current density, as in the Balbach and Moebius methods, the other with the aid of gelatin in an adherent form at a lower current density.

The electrolyte used is a copper-silver-nitrate solution, although recently Betts[1] has proposed using a silver methyl-sulphate solution.

These methods all have in common the characteristic of parting and refining bullion free from gold and tellurium at one operation, the deposited silver being melted and poured into bars without any further refining, as in the sulphuric-acid process. Silver placed in the tanks as anodes is not handled until taken out as refined silver, whereas in the acid method the silver either in solution or as cement must be transferred several times with the aid of siphons, steam, etc., before it is in a condition to be melted. For these reasons it is possible to operate an electrolytic parting plant with a higher degree of neatness and cleanliness (such as the value of the material treated requires) than is possible with acid parting.

A parting plant using the Balbach method is simple in construction and operation. Fig. 1 shows the cross-section of a tank. The cathode is made of one-half inch Acheson graphite slabs fitted to the bottom. Two silver contact pieces rest respectively on the bullion to be parted and the graphite slabs. Bullion cast in thin square slabs is contained in a cloth case which is supported on a wooden frame suspended over the tank. The gold slimes accumulate on the under side of the bullion, between it and the cathode, increasing the resistance as the operation continues. Each tank has a cathode surface of 8 sq. ft. and a current density of 20 to 25 ampères per sq. ft. is used. The voltage averages 3.8 per tank, and an average ampère efficiency of 93% was obtained on a continued run, while occasionally an efficiency of 98% was secured. The power required is 31.5 watt-hours per oz. of fine silver produced.

Most of the silver is deposited on the cathode surface directly under the anode, and the reduction of the distance between anode and cathode is limited by the space necessary to reach in and remove it, which has to be done frequently on account of the silver bridging across to the cathode. This serves also to agitate the electrolyte. There is gassing in this tank and the consumption of nitric acid is much higher than in the Moebius method.

At 20 ampères per sq. ft., about 32% of the daily output of each tank is held permanently in stock in electrolyte and contacts, which is less than is retained in the Moebius method.

In Fig. 2 is shown the cross-section of a Moebius tank. It is arranged in units of six placed end to end, each unit being provided with apparatus for raising the boxes containing the deposited silver together with the anodes and cathodes, and with arrangements for imparting a reciprocating motion to the wooden scrapers. There is no system of circulating the electrolyte, but the scrapers moving back and

*Abstract of a paper read at the eighth general meeting of the American Electrochemical Society, Bethlehem, Pa., Sept. 18, 19 and 20, 1905.

†Chemical engineer, Raritan Copper Works, Perth Amboy, N. J.

[1] *Electrochem. Industry*, April, 1905.

forth agitate it. The anodes are contained in a cloth frame which holds the gold slime, and the silver is brushed off from the silver cathodes by the wooden scrapers and drops into a box with hinged bottom. It is removed by raising the boxes above the top of the tanks and emptying it into a tray placed beneath. This operation requires one-half hour per day per unit. Each tank has a cathode surface of about 16.5 sq. ft., and a current density of 20 to 25 ampères per sq. ft. is used. The voltage between electrodes is 1.4 to 1.5, and the power cost is 13.2 watt-hours per oz. of silver deposited. An average ampère efficiency of 94% is obtained. At 20 amperes per sq. ft., 41% of the daily output of each unit is permanently held in stock in cathodes and electrolyte.

The necessity of cutting out of service the units of a plant using the Moebius method to remove the silver, and the frequent siphoning off and replacing of portions of the electrolyte in each tank in both the Balbach and Moebius methods, to maintain it of fixed compositions, are objections overcome by depositing the silver on the cathode in an adherent form.

This method permits of an arrangement of tanks and electrodes and a system of circulation of electrolyte similar to that used in the multiple system of copper refining.

The finely divided condition of the gold in the bullion, which in commercial work rarely contains more than 40 parts per thousand, requires that the anodes be inclosed in a cloth frame to keep the deposited silver free from gold, as the light, fine particles do not fall to the bottom of the tank with sufficient rapidity. A current density of 10 ampères per sq. ft. is used, and the power cost is nearly identical with the Moebius method. Twenty-eight to 32% of the daily output is retained in cathodes and electrolyte.

Gold from either the sulphuric or electrolytic parting process can easily be produced of a fineness of .990 or above, free from silver. The Government charges for melting and assaying such gold is so low, varying from 0.6 to 0.9 cent per ounce, depending on the weight of the bar, that there seems to be no immediate possibility of an electrolytic gold-refining process, such as the Wohlwill, becoming an attractive commercial proposition, except in those cases where platinum is present and the output large. Such a process would increase costs by delaying shipments, with loss of interest on gold in process, and that permanently held in stock in cathodes and electrolyte, and by increasing labor costs with no increase in the value received for the gold.

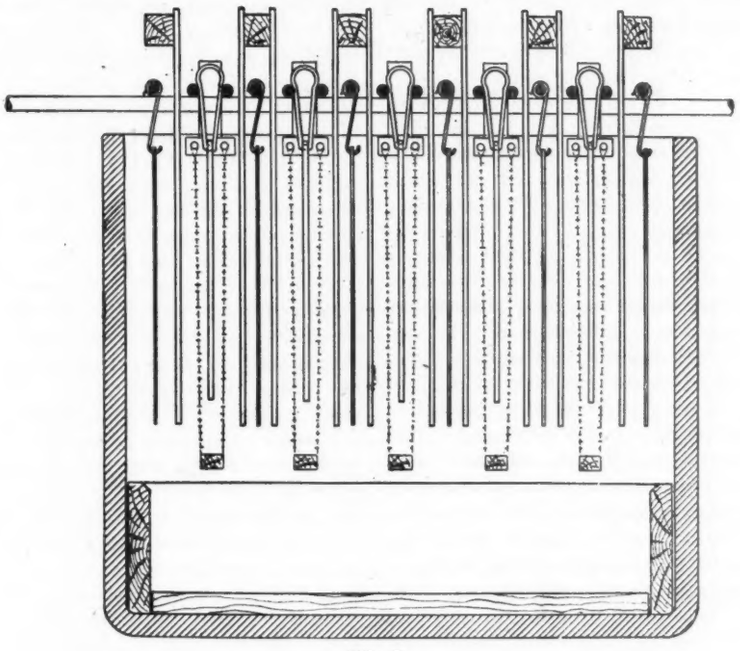


FIG. 2.

Solutions of High Specific Gravity.

According to *Comptes rend.* (1905, CXLI, 385-388) M. Duboin prepares solutions of high specific gravity by dissolving the alkali iodide and the mercuric iodide alternately in a small quantity of water, till no more of the substances are taken up. The liquid is warmed slightly and filtered after standing 24 hours. The densities at 26° C. of the following solutions were determined: Potassium mercuric iodide (Thoulet's liquid), sp. gr., 3,196. Sodium mercuric iodide, sp. gr., 3.46. Lithium mercuric iodide, sp. gr., 3.28. Ammonium mercuric iodide, sp. gr., 2.98. The sodium solution cannot be diluted with water, but dissolves without decomposition in alcohol and other organic liquids. It causes filter paper to thicken and become galatinous. Thoulet's liquid appears to hold the record in high specific gravity.

Lead Smelting in Reverberatory Furnaces at Desloge, Mo.

BY W. R. INGALLS.

The roast-reaction method of lead smelting in reverberatory furnaces never found any general employment in the United States, although in connection with the rude air-furnaces it was early introduced in Missouri. The more elaborate Flintshire furnaces were tried at Granby, in the Joplin district, but they were displaced there by Scotch hearths. The most extensive installation of furnaces of the Flintshire type was made at Desloge, in the Flat River district of southeastern Missouri. This continued in full operation until 1903, when the major portion of the plant was closed, it being found more economical to ship the ore elsewhere for smelting. However, two furnaces have been kept in use to work up surplus ore. As a matter of historic interest, it is worth while to record the technical results at Desloge, which have not previously been described in metallurgical literature.

The Desloge plant, which was situated close to the dressing works connected with the mine, and was designed for the smelting of its concentrate, comprised five furnaces. The furnaces were of various constructions. The oldest of them was of the Flintshire type, and had a hearth 10 ft. wide and 14 ft. long. The other furnaces were a combination of the Flintshire and Tarnowitz types. They were built originally like the newer furnaces at Tarnowitz, Upper Silesia, with a rather large rectangular hearth and a lead sump placed at one side of the hearth near the throat end, but good results were not obtained from that construction, wherefore the furnaces were rearranged with the sump at one side, but in the middle of the furnace, as in the Flintshire form. The rectangular shape of the Tarnowitz hearth was, however, retained. Furnaces thus modified had hearths 11 by 16 ft., except one which had a hearth 13 ft. wide.

The same quantity of ore was put through each of these furnaces, the increase in hearth area being practically of no useful effect, because of inability to attain the requisite temperature in all parts of the larger hearths with the method of heating employed. The men objected especially to a furnace with hearth 13 ft. wide, which it was found difficult to keep in proper condition, and also difficult to handle efficiently. Even the width of 11 ft. was considered too great, and preference was expressed for the 10-ft. width. In this connection, it may be noted that the old furnaces at Tarnowitz were 11 ft. 9 in. long and 10 ft. 10 in. wide, while the new furnaces were 16 ft. long and 8 ft. 10 in. wide (Hofman, *Metallurgy of Lead*, fifth edition, p. 112). All of these dimensions were exceeded at Desloge.

The Flintshire furnaces at Desloge had three working doors per side; the others had four, but only three per side were used, the doors nearest the throat end

being kept closed because of insufficient temperature in that part of the furnace. The furnace with hearth 11 by 14 ft. had a grate area of 6.5 by 3 ft. = 19.5 sq. ft.; the 11 by 16 furnaces had grates 8 by 3 = 24 ft. sq. The ratios of grate to hearth area were therefore approximately 1:8 and 1:7.3, respectively. (Compare with ratio of 1:10 at Tarnowitz, and 1:6⅔ at Stiperstones.) The ash pits were open from behind in the customary English fashion. The grate bars were cast iron, 36 in. long. The bars were 1 in. thick at the top, with ⅝ in. spaces between them. The open spaces were 32 in. long, including the rib in the middle. The bars were 4 in. deep at the middle and 2 in. at the ends. The distance from the surface of the grate bars to the fire door varied in the different furnaces. Some of those with hearths 11 by 16 ft. and grates 8 by 3 ft. had the bars 6 in. below the fire door; in others the bars were almost on a level with the fire door.

The furnaces were run with a comparatively thin bed of coal on the grate, and combustion was very imperfect, the percentage of unburned carbon in the ash being commonly high. This was unavoidable with the method of firing employed and the inferior character of the coal (southern Illinois). The excessive consumption of coal was due largely, however, to the practice of raking out the entire bed of coal at the beginning of the operation of "firing down" (beginning the reaction period), when a fresh fire was built with cordwood and large lumps of coal.

Each furnace had two flues at the throat, 16 by 18 in. in size, each flue being provided with a separate damper. Each furnace had an iron chimney approximately 55 ft. high, of which 13 ft. was a brick pedestal (64 by 64 in.) and the remaining 42 ft. sheet steel, guyed. The chimneys were 42 in. in diameter. The distance from the outside end of the furnace to the chimney was approximately 6 ft., and there was consequently but little opportunity for flue dust to collect in the flue. About once a month, however, the chimney was opened at the base and about two wheelbarrows (say 600 lb.) of flue dust, assaying about 50% lead, was recovered per furnace.

The furnace house was a frame building 45 ft. wide, with boarded sides and a corrugated-iron pitch-roof, suported by steel trusses. The furnaces were set in this house side by side, their longitudinal axes being at right angles to the longitudinal axis of the building. The distance from the outside of the fire-box end of the furnace to the side of the building was 10 ft. The coal was unloaded from a railway track alongside of the building and was wheeled to the furnace in barrows. Some of the furnaces were placed 18 ft. apart; others 22 ft. apart. The men much preferred the greater distance, which made their work easier, an important consideration in this method of smelting.

The height from the floor to the working door of the furnace was approximately 36 in. The working doors were formed with cast-iron frames, making openings 7 by 11 in. on the inside and 15 by 28 in. on the outside. On the side of the furnace opposite the middle working door was placed a cast-iron hemispherical pot, set partially below the floor-line. This pot was 16 in. deep and 24 in. in diameter; the metal was ¼ in. thick. The distance from the top of the pot to the line of the working door was 31 in.; from the top of the pot to the bottom of the tap-door was 7 in. The tap-door was 4 in. wide and 9 in. high, opening through a cast-iron plate 1½ in. thick Below the tap-door and on a line with the upper rim of the pot was a tap-hole 3½ in. in diameter. The frames of the working doors had lugs in front, against which the buck-staves bore, to hold the frames in position. All other parts of the sides of the furnace, including the fire-box, were cased with ⅝-in. cast-iron plates, which were obviously too light, being badly cracked.

The cost of a furnace when built in 1893 was approximately $1,400, not including the chimney; but with the increased cost of material, the present expense would probably be about $2,000. Notwithstanding the light construction of the furnaces, repairs were never a large item. Once a month a furnace was idle about 24 hours while the throat was being cleaned out, and every two months some repairing, such as relining the fire-boxes, etc., was required. If repairs had to be made on the inside of the furnace, two days would be lost while it was cooling sufficiently for the men to enter. In refiring a furnace, from 8 to 12 hours was required to raise it to the proper temperature. Out of the 365 days of the year, a furnace would lose from 20 to 25 days, for cleaning the throat and making repairs to the fire-box, arch, etc.

When a furnace was run with two shifts the schedule of operation was as follows:

Drop charge	4 a. m.
Begin work	7 a. m.
Begin firing down	11 a. m.
Begin first tapping	1 p. m.
Rake out slag	2.30 p. m.
Begin second tapping	3 p. m.
Drop charge	4 p. m.
Begin working	5.30 p. m.
Begin firing down	11 p. m.
Begin first tapping	1 a. m.
Rake out slag	2.30 a. m.
Begin second tapping	3 p. m.

With three shifts on a furnace, the schedule was as follows:

Drop charge	7 a. m.
Begin firing down	12 a. m.
Begin tapping	1 p. m.
Rake out slag	2 p. m.
Begin tapping	2.30 p. m.
Drop charge	3 p. m.
Begin firing down	8 p. m.
Begin tapping	9 p. m.
Rake out slag	10 p. m.
Begin tapping	10.30 p. m.
Drop charge	11.00 p. m.
Begin firing down	4 a. m.
Begin tapping	5 a. m.
Rake out slag	6 a. m.
Begin tapping	6.30 a. m

The hearths were composed of about 8 in. of gray slag beaten down solidly on a basin of brick, which rested on a filling of clay, rammed solid. The hearth was patched if necessary after the drawing of each charge.

The system of smelting was analogous to that which was practiced in Wales rather than to the Silesian, the charges being worked off quickly, and with the aim of making a high extraction of lead directly and a gray slag of comparatively low content in lead. The average furnace charge was 3,500 lb. At the beginning of the reaction period about 85 to 100 lb. of crushed fluorspar was thrown into the furnace and mixed well with the charge. The furnace doors were then closed tightly and the temperature raised, the grate having previously been cleaned. At the first tapping about 1,200 lb. of lead would be obtained. A small quantity of chips and bark was thrown into the lead in the kettle, which was then poled for a few minutes, skimmed, and ladled into molds, the pigs weighing 80 lb. The skimmings and dross were put back into the furnace. The pig lead was sold as "ordinary soft Missouri." The gray slag was raked out of the furnace, at the end of the operation, into a barrow, by which it was wheeled to a pile outside of the building. Shipments of the slag were made to other smelters from time to time, 95% of its lead content being paid for when its assay was over 40%, and 90% when lower.

Each furnace was manned by one smelter ($1.75) and one helper ($1.55) per shift, when two shifts per 24 hours were run. They had to get their own coal, ore and flux, and wheel away their gray slag and ashes. In winter when three shifts were run, the men were paid only $1.65 and $1.50 respectively. There was a foreman on the day shift, but none at night. The total coal consumption was ordinarily about 0.8 to 0.9 per ton of ore. Run-of-mine coal was used, which cost about $2 per ton delivered. The coal was of inferior quality, and it was wastefully burned, as previously referred to, wherefore the consumption was high in comparison with the average at Tarnowitz, where it used to be about 0.5 per ton of ore.

The chief features of the practice at Desloge are compared with those at Tarnowitz, Silesia, and Holywell (Flintshire) and Stiperstones (Shropshire) Wales, in the following table, the data for Silesia and Wales being taken from Hofman's *Metallurgy of Lead*, fifth edition, pp. 112, 113.

The regular furnace charge at Desloge was 3,500 lb. The working of three charges per 24 hours gave a daily capacity of 10,500 lb. per furnace. These figures refer to the wet weight of the concentrate, which was smelted just as delivered from the mill. Its size was 9 mm. and finer. Assuming its average moisture content to be 5%, the daily capacity per furnace was about 10,000 lb. (5 tons) of dry ore.

The metallurgical result is indicated by the figures for two months of operation in

1900. The quantity of ore smelted was 1,012 tons, equivalent to approximately 962 tons dry weight. The pig lead produced was 523.3 tons, or 54.4% of the weight of the ore. The gray slag produced was 262.25 tons, or about 27% of the weight of the ore. The assay of the ore was approximately 70% lead, giving a content of 673.4 tons in the ore smelted. The gray slag assayed approximately 38% lead, giving a content of 99.66 tons. Assuming that 90% of the lead in the gray slag be recoverable in the subsequent smelting in the blast furnace, or 89.7 tons, the total extraction of lead in the process was 523.3 + 89.7 ÷ 673.4 = 91%. The metallurgical efficiency of the process was, therefore, reasonably high, especially in view of the absence of dust chambers.

Detail.	Holywell.	Stiperstones.	Tarnowitz.	Tarnowitz.	Desloge.
Hearth length, ft.	12.00	9.75	11.75	16.00	16.00
Hearth width, ft.	9.50	9.50	10 83	8.83	11.00
Grate length, ft.	4.50	4.50	8.00	8.00	8.00
Grate width, ft.	2.50	2.50	1.67	1.67	3.00
Grate area: hearth area	1:8	1:6⅔	1:10	1:10	1:7½
Charges per 24 hr.	3	3	2	2	3
Ore smelted per 24 hr., lb.	7,050	7,050	8,800	16,500	10,500
Assay of ore, % Pb.	75–80	77.5	70–74	70–74	70
Gray slag, % of charge	12	....	15	30	27
Gray slag, assay % Pb.	55	....	38.8	56	38
Men per 24 hr.	6	4	4	8	6
Coal used per ton ore.	0.57–0.76	0.56	0.46	0.50	0.90

The cost of smelting with five furnaces in operation, each treating three charges per day, was approximately as follows:

1 foreman at $3	$ 3.00
5 furnace crews at $9.90	49.50
Unloading 21 tons of coal at 6c.	1.26
Loading 14 tons lead at 15c.	2.10
" 7 tons gray slag at 15c.	1.05
Total labor	56.91
21 tons coal at $2	42.00
Flux and supplies	13.00
Blacksmithing and repairs	10.00
Total	121.91

On the basis of 6.25 tons of wet ore, this would be $4.65 per ton. The actual cost in seven consecutive months of 1900 was as follows: Labor, $1.98 per ton; coal, $1.86; flux and supplies, $0.51; blacksmithing and repairs, $0.39; miscellaneous, $0.017; total, $4.757. If the cost of smelting the gray slag be reckoned at $8 per ton, and the proportion of gray slag be reckoned at 0.25 ton per ton of galena concentrate, the total cost of treatment of the latter comes to about $6.75 per ton of wet charge, or about $7 per ton of dry charge. This cost could be materially reduced in a larger and more perfectly designed plant.

The practice at Desloge did not compare unfavorably, either in respect to metal extracted or in smelting cost, with the roast-reduction method of smelting or the Scotch hearth method, as carried out in the plants of similar capacity and approximately the same date of construction, smelting the same class of ore, but the larger and more recent plants in the vicinity of St. Louis could offer sufficiently better terms to make it advisable to close down the Desloge plant and ship the ore to them. One of the drawbacks of the reverberatory method of smelting was the necessity of shipping away the gray slag, the quantity of that product made in a small plant being insufficient to warrant the operation of an independent shaft furnace.

Coal-Dust Firing.*

BY EUSTACE CAREY.†

Given dry coal dust a sufficient fineness, it is possible, with a regulated supply of air, to burn it so that economy of fuel will result, and, in addition, with the advantage of freedom from smoke. This matter presents itself to most technical men who have given attention to the subject of economy of fuel. But hitherto the cost of dry coal dust of sufficient fineness has been a great difficulty. Some years ago I was informed that the grinding of the coal to a sufficient degree of fineness would certainly cost not less than one shilling per ton. I am now informed that grinding need not cost more than sixpence a ton, including interest and depreciation.

In 1876 trials were conducted by the American government to determine the value of a system of burning powdered fuel (patented by Messrs. Whelpley and Storer). It appeared that the use of powdered fuel was more expensive than that of lump coal, in the ratio of the cost of pulverization, and so far the scheme was a failure. One cause of this was that the arrangement would not permit the coal-dust to be burned fast enough. All these experiments were of short duration—two hours, four hours, five hours and so on—far too short a time to establish any real knowledge of the subject.

Mr. Brian Donkin in his book[1] describes Mr. Crampton's experiments between 1868 and 1873 with powdered coal, which experiments were conducted only for the purpose of the prevention of smoke. On page 180 he refers to the Wegener powdered-fuel boiler, furnace, and apparatus; details of two experiments with the Wegener apparatus are from *The Engineer* of May 15, 1896, as given herewith:

	Without.	With.
Total coal burnt.	1,600	1,415
Coal burnt per hour.	225	211½
Moisture in coal, %.	9	1.2
Ashes.	About the same	
Temperature of feed water entering the boiler, °F..	63	48.2
Lb. of water evaporated per lb. of wet coal.	4.95	7.46
Same calculated from 212° F.	5.9	9.0
Water evaporated per lb. of dry coal with feed water at 212°.	6.48	9.11
Thermal efficiency of boiler	54	71
Temperature of gases at the base of the chimney, °	438	412

The smoke observed was very much less in the dust experiment than in the large-coal experiment. Mr. O. G. Bartlett read a paper which appeared in the *Journal* of the Association of Engineering Societies, before the Civil Engineers' Club, at Cleveland, in May, 1903. He says: "To burn coal in a powdered form successfully, three things are necessary: uniformity of moisture, uniformity in size of grain, and the amount of air required for perfect combustion." He reminds us that coal varies very much in moisture; therefore, uniformity in moisture is necessary for any satisfactory and comparative experiment; it is impossible to get the best results by burning large pieces of coal together with the dust. He recommends that all coal used for firing be reduced to grains of equal size; and for mechanical firing, the dust should be passed through a sieve of not less than 80-mesh; a requisite amount of air should be delivered to the coal (which he believes to be about 140 cu. ft. of air per lb. of coal). If these three conditions are carefully observed, the results will be: (1) No black smoke; (2) no cinders and little ashes; (3) a saving practically of 40% in the amount of coal used. He estimates that the cost of drying will be less than 12c. per ton of coal, if not less than 40 tons a day is dried. The other cost he placed at 31c., or a total of 42c. a ton; so that we have not yet got to the one shilling a ton for drying and grinding.

G. K. Stephenson, of Valparaiso, invented an apparatus for burning coal dust, and observed some of the objections to Whelpley and Storer's plan. The arrangement is such that the coal is not ground to an impalpable powder, but is somewhat coarse; the supply of coal-dust and that of air are independent; this is important. Another valuable feature is that, in the furnace, Stephenson places a fire-clay retort, the sides of which are perforated with numerous holes.

In an experiment conducted by Mr. Baker, of Birmingham (the trial lasting five hours), water was evaporated at the rate of 8.312 lb. per lb. of coal at 81° F.; in an experiment with the same boiler hand-fired, evaporation was 6½ lb. per lb. of coal. Stephenson proved that an apparatus can be made which will work without trouble, and which is inexpensive and simple, but there are no data as to cost of grinding the fuel.[2]

Mr. Barr says that it appears to be proved that a retort (or its equivalent;

*Abstract of a paper read at the Liverpool section of the Society of Chemical Industry, March 8, 1905.

†Chairman of the Liverpool section.

[1] "The Heat Efficiency of Steam Boilers," published in 1898.

[2] Wm. M. Barr, "Practical Treatise on the Combustion of Coal."

that is to say, a firebrick lining at the front part of the boiler flue) is necessary; it is shown that a chemical equivalent of air will suffice to produce combustion without smoke.

From the foregoing, it appears that by means of coal-dust firing, a better evaporation of water per lb. of coal can be obtained than by firing with coal which is not reduced to dust; the problem for some years past has been not so much to establish this fact as to produce coal dust at a reasonable price.

At Haydock, they have been at work for some years devising apparatus for drying and grinding, which really comprise the problem that is to be solved. The drier consists of a revolving cylinder (4 ft. diameter outside and 27 ft. long, making 6 r. p. m.); it is found that 1 lb. of carbon evaporates 8 lb. of water from the coal, which, when delivered direct from the pit, usually contains from 4 to 6% of moisture. The cylinder is divided into four separate compartments; in the interior of the compartments are projecting angle irons called "lifters," for mixing and agitating the contents.

The material to be dried is fed into a spout, and on falling to the mouth of the cylinder is divided equally between the four compartments; through the slow revolving motion of the cylinder it is caught successively by the "lifters" and by this means the material is thinly spread over a large portion of each compartment, and carried round and "cascaded" (turned over continuously) through the whole length of the drier.

As the vapor during drying is given off inside the cylinder, it is continuously drawn off by a fan through a trunk and blown into a large chamber. The chamber is provided with baffle-walls against which the dust is blown; it falls to the bottom of the chamber, and is finally carried away by a chain conveyor.

The drier is heated by a furnace which is fired by a Schwartzkopff coal-dust burner, the furnace being lined with firebrick. As the gases or products of combustion leave the fireplace they are diverted by a baffle-wall, and also pass through apertures formed by the diagonal walls which separate the four compartments, eventually leaving the cylinder chamber by the flue opening to the chimney.

Warm air(which is heated by being drawn through the apertures in the brickwork of the furnace and the chamber) is pulled through the interior of the drier, the current of heated air meeting the material to be dried. The temperature of the fuel in the drier is kept at about 120° F.

The burner consists of a hopper into which the dust is conveyed, and a mover inside, which is rotated; the bottom of the hopper is agitated. The dust is actually spread and projected into the fireplace by a brush which revolves at from 800 to 1,000 r. p. m. The speed of the brush varies but slightly with the quantity of fuel which is sent into the furnace; for, whether the fuel quantity is large or small, it has to be projected so that it shall reach every part of the furnace.

The burning fuel should come in contact with a brickwork screen for a distance of about 6 ft., this being necessary, in order to obtain complete combustion. The wear and tear upon the feeding part of the apparatus, or on stoker, is very small.

At the wire works of Richard Johnson & Nephew, of Bradford, they employ these dust-firing stokers for their annealing furnaces, and economy has been effected in the quantity of apparatus employed for annealing; the wear and tear upon the brush is trifling.

As regards the cost of the various operations at Haydock, about 500 ton of coal is ground and dried per week, and is used in a 500-h.p. Stirling boiler. They work only by day; the following costs would be considerably reduced if they were to work continuously the whole 24 hours. The capital employed in the drying and grinding in this quantity of fuel is £2,770. Other details are given herewith:

	Per Annum.
10% for repairs and depreciation	£270
5% interest	135
Stores	50
Wages of two men	125
Total	£580

The 500 tons of fuel per week multiplied by 52 weeks is 26,000 tons per annum. The £580 divided by 26,000 gives, say, 5.35d. (11 1-6c.).

As regards the burning of this coal-dust, investment is £2,230. Details are:

10% depreciation	£223
5% interest	111
Oil and stores	50
Wages for one man	62
Total	£447

The £477 divided by 26,000 gives 4.12d. per ton, or, say, 9.47d. (19c.) for drying, grinding and burning, to which 2d. (4c.) must be added for power.

But suppose two shifts are worked instead of one, this brings down the cost of drying and grinding to 3.5d. (7c.); and the cost of stoking to 2.58d. (5c.); or a total of 7.68d. (15.4c.).

The final report of the Royal Commission on Coal Supplies is interesting in this connection; from 1869 to 1903, inclusive, 5,694,928,507 tons of coal has been raised; nevertheless the present estimates of available coal are, 10,707,382,769 tons in excess of that of the previous Commission. The Commission adds: "We are convinced that coal is our only reliable source of power, and that there is no real substitute."

In our coal mines and on the surface there are large accumulations of inferior coal which is not suitable for ordinary use; but a plant which will dry and grind fuel and burn the dust, renders it possible to use large quantities of this supply which has hitherto been looked upon as refuse. On the average about 5 to 10% seems to be thrown away, either in the mine or at the surface; that of itself is a very considerable supply of fuel which could be rendered available by a successful coal-dust firing apparatus.

[In the ensuing discussion, Max Muspratt said that there are three directions in which coal-dust firing might be of immediate advantage: First, all know that gas-firing has some advantages, but the great disadvantage of gas-firing is that in order to get a certain amount of gas (the gas corresponding to about a ton of fuel), one has to utilize something like 30 cwt. of fuel in all. Second, where fuel is fairly high in price, the expense of grinding, which might be very serious in an ordinary slack, is compensated by the greater economy where the fuel is high-priced; he thought that in this direction the process described is of utility. Thirdly, in case of very cheap fuels (the very low-priced fuels which at present it is difficult to utilize at all) the Schwartzkopff process may be of great utility; if it enables one to use practically the stuff off the waste bank instead of slack at 5, 6 or 7s. a ton, obviously it will well stand the expense of grinding.]

Tensile Strength of Copper-Tin Alloys.

A. S. Shepherd and G. B. Upton (*Jour. Phys. Chem.*, 1905, IX, 441-476, and *Chem. Centr.*, 1905, II, 538; see also *Jour. Soc. Chem. Ind.*, 1896, 810; 1901, 814; 1905, 241) have tested the tensile strength of copper-tin alloys. They fmd that the tensile strength of alloys containing the pure alpha-crystal rich in tin is not much affected by heat. Bronzes containing 74.87% of copper become much stronger if they are heated above 510° C.; by long-continued heating the tensile strength is diminished, but the ductility is increased. The alloy containing 78.81% of copper has a maximum tensile strength; it consists of a mixture of alpha- and beta-crystals. It is possible to prepare, on the one hand, a cast bronze with a maximum tensile strength of 60,000 lb. per sq. in. and an extension of 1.5%; and, on the other hand, a bronze with a tensile strength of 45,000 lb. per sq. in., and an extension of 39%.

Articles of silver to be oxidized green should be scratch-brushed to a dead luster with the aid of a brass-wire scratch-brush, water, and flour-pumice. The pieces are then immersed for ½ to 1 min. in a solution consisting of 2 oz. of sulphate of copper dissolved in 1 gal. of hot water. This will produce a green color, which will be brought out more prominently after the pieces are lacquered.

Russian Petroleum Losses.

The naphtha producers and manufacturers at Baku (considering the report on the damage inflicted on the petroleum industries during the late riots, a report which was prepared by the commission appointed by the Russian Minister for Finance, underestimated the losses) appointed a committee of their own to study the question. The report has just been published. While practically agreeing with the Government report as to the material and working value of the plant destroyed above ground, the manufacturers' committee sets the amount of money required to restore Baku to its former condition at 40,000,000 roubles, just a trifle more than twice the figure at which the Government assessed the total loss.

Both reports may be summarized as follows:

	Government Report.	Naphtha Industries' Report.
Percentage of derricks destroyed....	60	58½
Average output of destroyed derricks	27,200,000 poods per month	920,920 poods per diem
Money loss incurred by destruction of plant and naphtha	19,776,000 roubles	28,700,000 roubles
Appreciation of material required to reinstate plant....	.....	13,300,000 roubles

The manufacturers' committee observes, in order to justify its own conclusion, that the Government assessment of losses confines itself to those sustained above ground, whereas, in point of fact, considerable damage was done under the surface. The pipes of the wells were found in many cases to be stopped up by foreign bodies and half-burnt wreckage, which will delay the resumption of operations for some time. Some 7,000,000 roubles must be added to cover loss from these causes. The committee maintains, also, that the Government has assessed the money loss according to prices normally obtaining; whereas, in point of fact, the value of timber and iron, to say nothing of labor, has so much appreciated in the Baku district on account of their general scarcity that 40% at least must be added to the above assessment of loss; so that 40,000,000 roubles would more nearly represent the damage done, as far as can be at present ascertained, than any lower figure.

The prices for oil residues (mazout) in Astrachan have moderated somewhat, being now about 36 kopecks bid, while a number of small consignments of petroleum have changed hands at 37½ kopecks. A large deal by the Caspian and Mantascheff Companies, through the medium of the Russian Bank, is reported, in which these companies sold 1,000,000 poods of mazout to the Orient Company, one-half at 33 kopecks cash and the other half at 34 kopecks bills. The more prices come down, the smaller are the companies' chances of recouping their losses.

Flow of Solids.

A. von Obermayer, G. Tammann, N. Werigin and J. Lewkojew (*Beiblätter, Ann. der Phys.*, Leipzig, 1905, XXIX, p. 6; and *Proc. Inst. Civil Eng.*, 1905, CLX, p. 65) discuss the flow of solids under pressure. Ice, camphor, clay, paraffin wax, beeswax and ceresin, all show disc or scale structures after being forced through a hole in a steel cylinder. The discharged ice formed conglomerating grains of about 1-25 in. diameter. For ice and paraffin wax, the efflux velocity was found to be nearly proportional to the cube of the pressure. The speeds of flow of potassium, sodium, lead, thallium, tin, bismuth, cadmium, zinc and antimony, at constant pressures and at temperatures of from 212° to 365° F. (100° to 180° C.), were in the order given. Zinc did not flow until a pressure of 30,000 lb. per sq. in. was applied; while antimony showed no movement under a pressure of 45,000 lb. per sq. in. and in a temperature of 480° F. (249° C.). In general, the rate of flow of the metals was doubled for an increase of temperature of 18° F. (10° C.). At 392° F. (200° C.) the rate of flow of lead was very markedly reduced, whereas thallium showed a distinct softening at 356° F. (180° C.).

A French company, "La Rubis," has just been incorporated, with a capital of 200,000 francs ($38,000), to manufacture and sell artificial precious stones made by synthetic processes.

A New By-Product Coke-Oven.

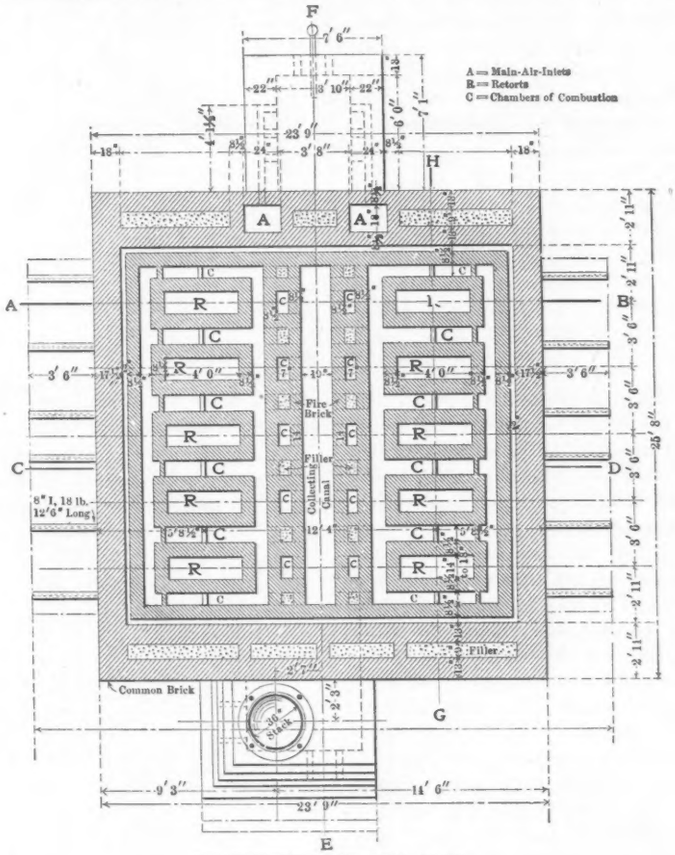
BY R. SCHORR.*

This oven is specially designed to coke lean coals and also non-caking fuels with the addition of oil, oil residues, coal-tar, molasses, etc.

In this JOURNAL (Feb. 16, 1905) was described the manufacture of lampblack-oilcoke in a large installation at station "B," Oakland, of the California Gas & Electric Corporation. A small oven for lignite-coking was erected meanwhile in the Southern Pacific yard, at West Oakland, and some very interesting runs made under different conditions with various American lignites.

The standard 10-retort unit of ovens of this type consists of two banks of narrow vertical chambers 16 in. by 4 ft. by 15 ft. and disposed between the same are three canals. The one centrally located serves to preheat all air necessary for the combustion of the gases; the uppermost one acts as a collecting canal for the products of combustion and the lowest one forms the main flue connecting to the stack.

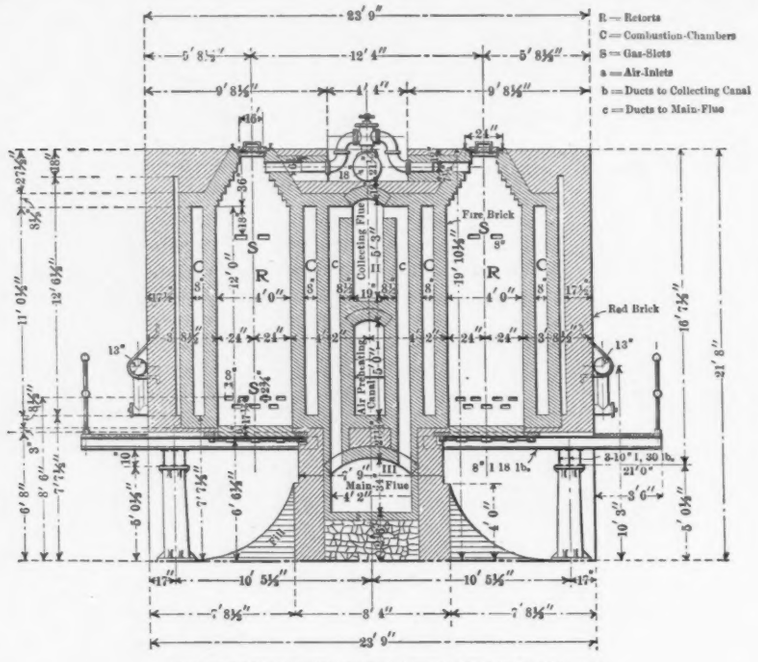
Each retort is surrounded by a concentric space, the combustion chamber, into which the gases developing inside the retort escape through a number of inclined slots. Into the same space the thoroughly preheated air enters to accomplish the combustion. The resulting products cir-



BY-PRODUCT COKE-OVEN, PLAN.

*Mining engineer, San Francisco.

culate in horizontal and vertical directions until discharging through upper openings into the collecting canal. From there they descend through vertical ducts into the main flue which connects to a stack with damper.



BY-PRODUCT COKE-OVEN, CROSS-SECTION ON A B.

The preheating of the air is effected by drawing the cold air from the top of the oven and through an auxiliary fire-box into the main air-preheating canal, which is provided with a number of baffle plates or with checker work.

In operation, the raw fuel is charged from the top, by any suitable means, into the retorts. The coke is withdrawn from below by opening the hinged discharge doors, which form the bottom of each retort. The doors are operated by hand or by mechanical means. The coke descends by gravity and is quenched right there. If the recovery of by-products is practical, all inclined gas slots in the sides of each retort are closed up with fire-clay and the gases are drawn off from the top of each retort into a main collecting drum. They are piped thence to coolers, scrubbers and such other appliances as may be necessary to free the gases from such valuable matter as they may carry. The cleaned gases are returned to the oven and there enter the combustion chamber, surrounding each retort, opposite to the air inlets, and ignite. The heat distribution throughout the structure is very thorough, the coke is very dense and the yield considerably higher than in any horizontal oven. Each retort holds about 3,300 lb. of coal, which makes 16½ tons for the whole oven. There are 500,000 firebrick, 60,000 red brick and 20,000 lb. of iron in the construction, costing complete approximately $6,000. The guiding objects for the design were the following points: To permit coking of lean coals and of non-caking fuels with the addition of oil, oil residues, coal-tar, molasses and the like; to increase the efficiency by thoroughly preheating all air necessary for the combustion of the gases; to confine the heat and to reduce losses due to radiation; to avoid mechanical appliances for discharging the coke, and to economize in floor space covered.

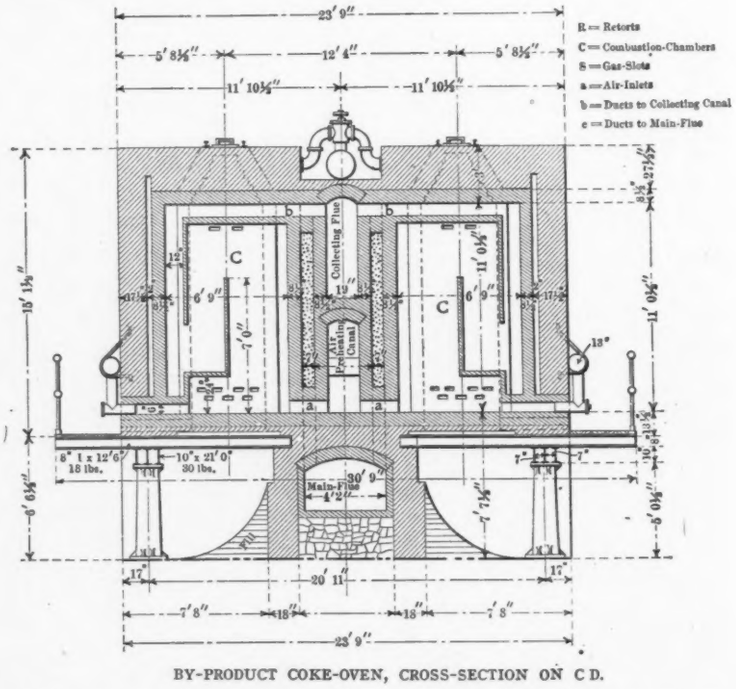
Silver can be prevented from cracking during the process of rolling, by rolling it after it has been well annealed. As soon as it becomes hard it is annealed again. Aluminum works in the same manner. Many other metals can also be rolled without breaks if this rule be observed.

The Drown Memorial.

Supplementing a previous statement of the inception of a memorial to Dr. Thomas Messinger Drown, ground was broken on the campus of Lehigh University on Oct. 12 for the erection of Drown Memorial Hall.

The trustees and alumni of Lehigh University are contributing liberally to the project, and Dr. Drown's friends in Massachusetts have shown active interest in the erection of this monument. The committee now appeals to the members of the American Institute of Mining Engineers, and to others interested, to aid promptly and largely in the erection of this most appropriate memorial to their friend and associate.

Dr. Drown served the Institute faithfully and to its great benefit, first as manager, then for many years as secretary, and finally as president. In 1884 he was unanimously elected an honorary member. His lifework was crowned by his service as president of Lehigh University for nearly ten years. He was devoted to the work, and accomplished great results in the promotion of technical education. This memorial to him most appropriately shapes the earnest wish he expressed in the last years of his life—a desire to give to the young men under his charge a building devoted to their special need and comfort, for their meetings and for a resting place between hours of duty. Also, it is proposed to provide in this building accommodations for visiting scientific and technical societies and to erect a mural tablet.

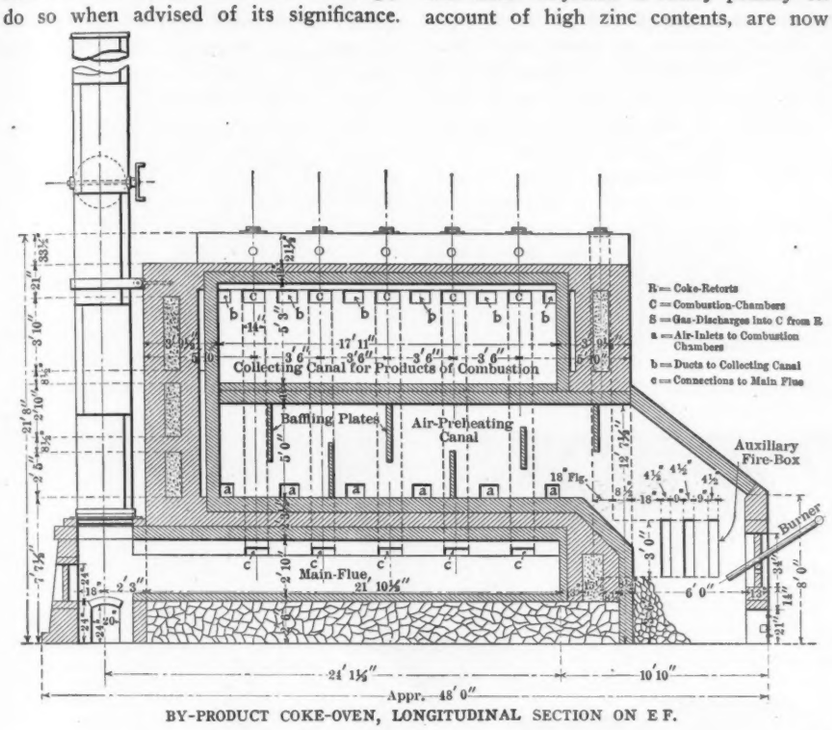


BY-PRODUCT COKE-OVEN, CROSS-SECTION ON C D.

Subscriptions are desired, not only from those who came into close personal contact with Dr. Drown, and who have been helped by his influence, but also from his friends and associates who wish to show

their appreciation of his service in education and science.

A number of Dr. Drown's colleagues in the American Institute of Mining Engineers have joined in this movement; it is believed that many others will willingly do so when advised of its significance.



BY-PRODUCT COKE-OVEN, LONGITUDINAL SECTION ON E F.

For this purpose, $100,000 (as stated in Dr. Dudley's address) is required, of which, so far, less than half has been secured. It is earnestly hoped that the remainder may be subscribed, so that it may not be necessary to sacrifice anything of the beauty and completeness of the memorial as now planned. Contributions have been received of from $5 to $1,000.

Charles B. Dudley, of Altoona, Pa., is chairman of the committee in charge of the memorial.

Aluminum may be platinized by polishing and rubbing with platinic chloride rendered slightly alkaline. The layer of platinum is made thicker by repeated application. Potash lye is carefully added to a solution of 5 to 10% of platinic chloride in water, till a slightly alkaline reaction is shown (on filter paper or a porcelain plate) by phenol-phthalein as indicator. This solution must always be prepared fresh. Vessels to be platinized should be cleaned with sea sand moistened with water containing 5 to 10% of oxalic acid, and then well rinsed.

Electrolytic nickel has the usual appearance of all metals which have been deposited in a thick layer. The deposit is not strictly "reguline,' as it is almost a commercial impossibility to prevent the formation of "warts" or "pimples" upon the surface of the cathode. These are probably caused by dust or small foreign particles in the solution.

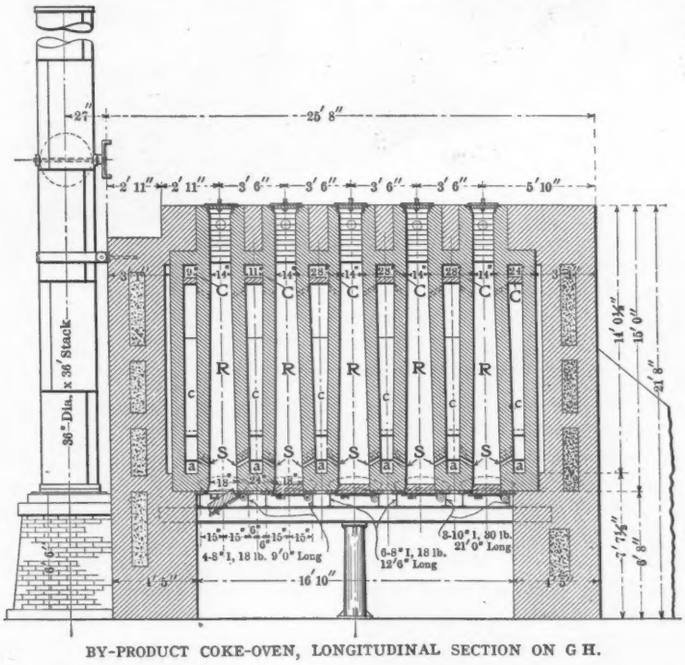
Zinc in Mexico.

Development of zinc ores in Mexico has recently been stimulated by an active demand for them from the United States. Mines, the product of which has heretofore been subjected to heavy penalty on account of high zinc contents, are now being reopened, and dumps are carefully picked over for zinc ore. Nuevo Leon is the producing State, and buying agencies are centered at Monterey and Villaldama, where competition among buyers has raised prices to unexpectedly high figures. Ores of 37 and 38% zinc are now produced and sold, whereas, previously, only those carrying 42 or 43% found a sale.

In this and in other districts, the denunciation of zinc-yielding properties, many of which offer no other wealth, is becoming frequent. The zinc ores of Nuevo Leon are mainly carbonate, an ore of rare occurrence in the United States; at Xochiapulco and Xochitlan, in Pueblo, blende of as high grade as 50% zinc is found; and at Taxco in Guerrero, Mazapil, Sombrerete and Plateros in Zacatecas, large amounts of blende are known to occur with the rich silver ores. If demand for zinc ore continues, this metal will soon rank with the others as a source of Mexican wealth.

In its course of 3,000 ft. over the cascades above the Horseshoe Falls, the Niagara river descends 55 ft. With 222,000 cu. ft. per sec. as the total normal discharge of the river, and with 90% of this discharge going down the Canadian channel, the volume there is 199,800 cu. ft. per sec. This volume of water falling 55 ft. makes available somewhat more than 1,370,000 h. p. on the Canadian side.

Well made 1 : 5 portland cement concrete, of good standard gravel or limestone screening, will have a compressive strength at four weeks of over 2,000 lb. per sq. in.; and at one year, over 3,000 lb. Tests made at the Case School of Science showed that 3 in. cubes of ½ : 6 portland cement and gravel concrete had a compressive strength of 3,200 lb. per sq. in. at six weeks, a sp. gr. of 2.17, and an absorption of water of 4.16%. Similar cubes of 1½ parts cement, ½ hydrated lime, and 6 of sand and gravel had a strength of 3,880 lb., a sp. gr. of 2.18, and an absorption of 4.10. Cubes of 1½ parts of cement and 6 of limestone screening, poured in a porous mold, had a strength of 2,000 lb., a sp. gr. of 2.5, and an absorption of 5.04.



BY-PRODUCT COKE-OVEN, LONGITUDINAL SECTION ON G H.

Mexican Water Concessions.

The law governing the granting of water concessions in the State of Chihuahua, Mexico, has been amended to read as follows:

Art. 1. Concessions for water of rivers, reservoirs and other sources of public property of the State, whether for irrigation or other purposes, will be authorized by the executive of the State, and must be solicited in writing, expressing the full name of the applicant, residence, if the water is to be employed in irrigation or for power, amount of water desired, place where it will be taken from and work to be done by use of the water.

Concessions will then be granted under the following conditions:

II. Applicant shall within four months after solicitation of concession, as published in the *Periodico Official*, present the plans and descriptive information of the hydraulic works that will be used to consume the water; and shall also state at what place the water will return to its natural course.

The concessioner shall be obliged to admit inspection of the works when considered necessary by the chief executive.

III. Construction of the necessary works shall commence within twelve months and be completed within a like period, counting from date the concession is granted.

IV. The concession will be declared forfeited and the waters returned to the State in case the water is not used for two years without just cause.

V. Payment of the amount charged for the concession shall be made to the State treasurer, or sub-treasurer, within thirty days after advice is given the petitioner of the amount required.

Art. 2. If within one month after printing a solicitation for a concession for water there is no opposition from the municipality or individuals, the executive will authorize granting of same.

Art. 4. All oppositions made against petitions for water must be made to the chief executive who will refer it to the *jefe politico* of the respective district that a decision may be rendered.

Hollow metal castings are "flushed"; that is, the mold is filled with molten metal, and before it becomes cooled, after a sufficient thickness of the walls is hardened, the remaining metal is poured out, thus leaving the outer shell in the mold. Much experience is required to obtain castings of correct weight and strength. The process is used in the manufacture of spouts and hollow handles, such as are used in table ware.

In a 50 horse-power boiler, 12 to 15 lb. of raw potatoes cut into pieces about the size of a walnut has been used, for the prevention of scale, with excellent results. If the peels are likely to get into the gage cocks, the potatoes should be pared.

Allis-Chalmers Turbo-Generator.

A 1,500-kilowatt turbo-generator of the Allis-Chalmers make has just been put into operation at the Washington street power-house of the Utica Gas and Electric Co., Utica, N. Y. This is the first turbine of this make to be put under steam pressure; it is designed for 1,500 kw. at 1,800 r. p. m., with a continuous overload capacity of 25% and a three-hour overload of 50%. The momentary overload capacity is 100%. The generator is a two-phase, 60-cycle, revolving-field alternator, operating at 2,500 volts; it is ventilated by an electrically-driven fan blower.

The turbine proper is of the Parsons type, with some essential points of difference in the mechanical details. The blading is produced by machinery and is secured to the base rings by dovetailing, the base rings themselves being keyed to the shaft and the cylinder, respectively. A shroud ring is provided for reinforcing the tips of the blades and to ensure their accurate spacing. The tips are slotted into these rings and then riveted fast; the rings themselves are of channel cross-section, and are shown, with the blading, in Fig. 3.

A special feature will be noticed by referring to Fig. 2, viz., the absence of the usual low-pressure "balance piston"; the photograph shows but two, instead of the three, pistons formerly used in this type of turbine. In this construction there is, however, a third balance piston, but instead of being at the high-pressure end of

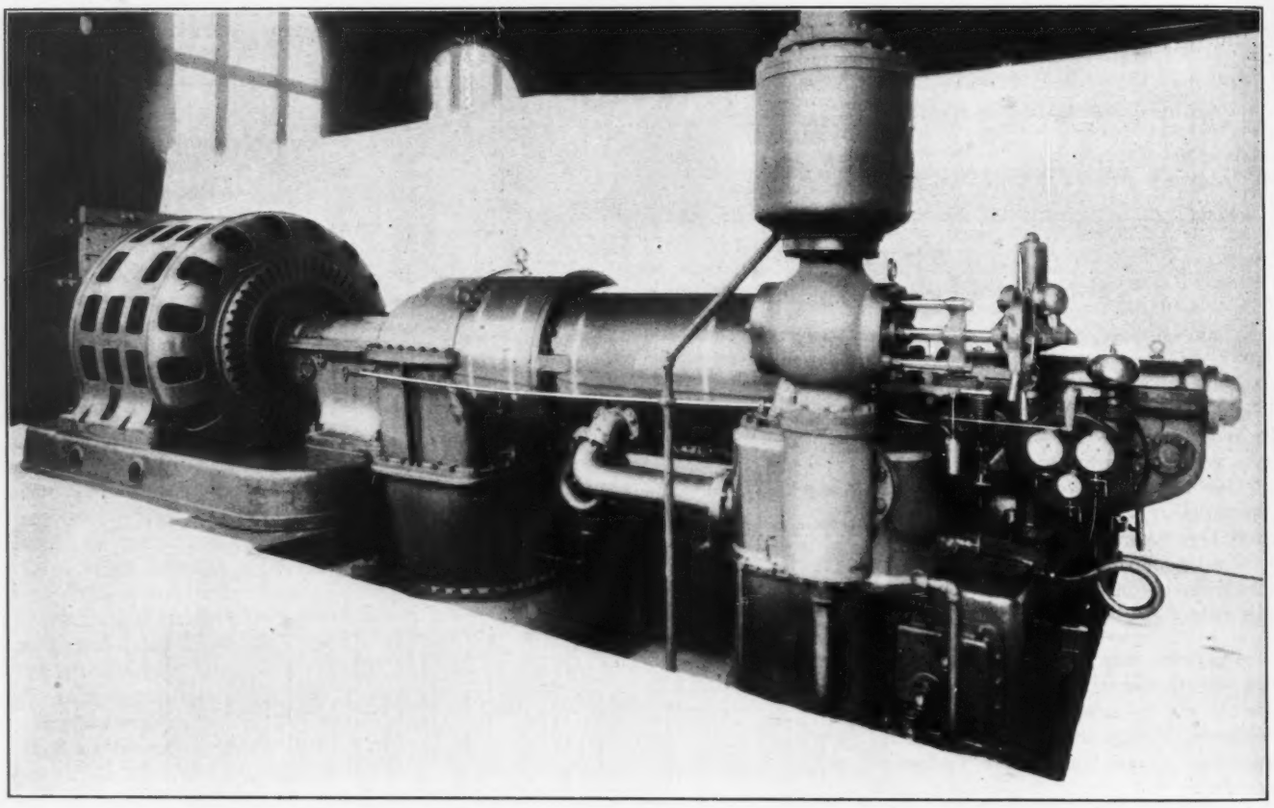


FIG. 1. ALLIS-CHALMERS TURBO-GENERATOR, GENERAL VIEW.

the turbine, it is at the low-pressure end; it is smaller than the large end of the spindle and hidden from sight in the illustration. Its circular area is equal to the annular area of the pistons used in the older construction, and the low-pressure balance piston is made much smaller. A labyrinth packing of radial baffling type is used.

The Utica turbine was built for the Allis-Chalmers Co. by Willans & Robinson, of Rugby, England, to whom a number of contracts were sublet by the Allis-Chalmers Co. before the latter had completed the installation of their special machinery for turbine manufacture. The first steam turbine of the company's make, one of 5,500 kw. capacity, has recently been shipped from its shops at West Allis, Wis., where work of this character is now being carried on.

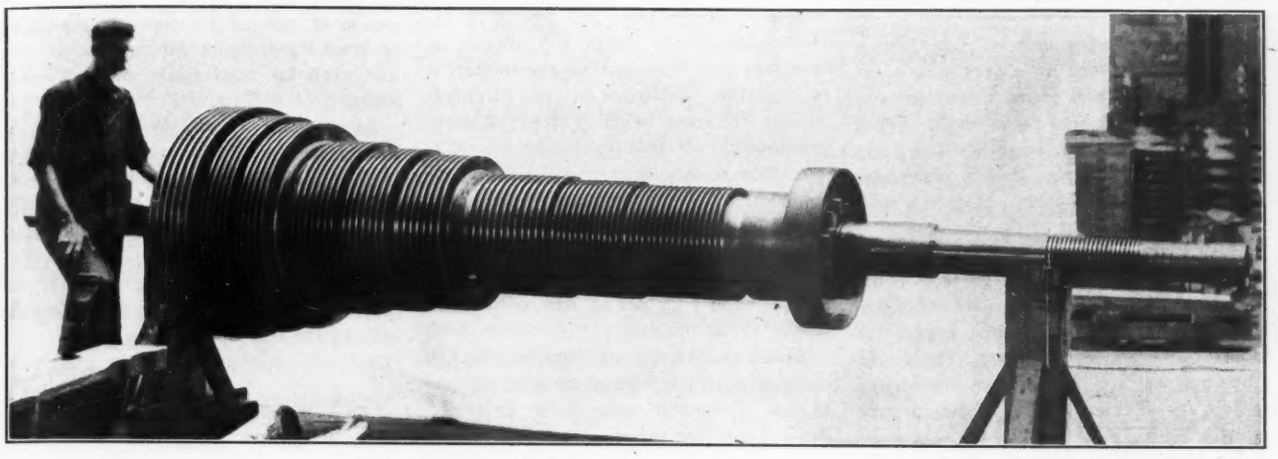


FIG. 2. ALLIS-CHALMERS TURBO-GENERATOR, REVOLVING ELEMENT.

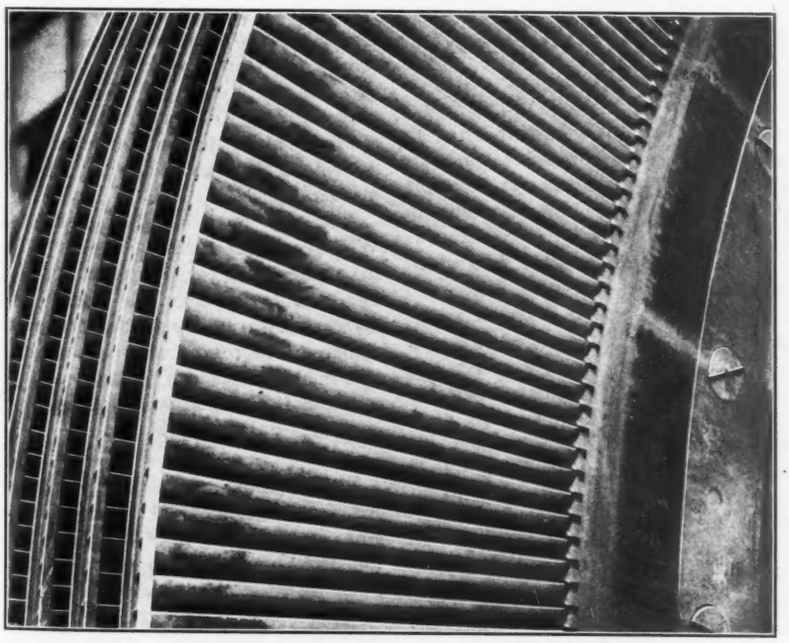


FIG. 3. ALLIS-CHALMERS TURBO-GENERATOR, BLADING.

Bone-dust cupels for assaying should be well dried, several months, if possible, before using.

Sand Launders.

BY THOMAS T. READ.*

The use of launders for the movement of solid material in water currents is now wellnigh universal. Their design and construction seems usually to be regarded as being in the province of the millwright and one which is not to be invaded by those who persist in trying to discover reasons for things. In other words, having discovered what sort of launder your neighbor is using, it is generally considered proper to build one just like it.

It is obvious that a solid particle may be transported by moving water in either of two ways; it may be carried in suspension, or it may be pushed or rolled along the bottom of the water channel. The diameter of the particle which any given current will transport depends somewhat on its shape, but chiefly on the square of the velocity of the current.

In the case of fine material, it is comparatively easy to secure a velocity such that all the material will be in suspension. Under such circumstances, the well-known formulæ for the flow of water in open channels will apply, with perhaps some slight change due to the increase of density of the liquid. In order to obtain the required velocity, with the least possible slope of launder and with least volume of liquid, it is necessary that the "wet surface" be as smooth as possible and that the "wetted perimeter" be the least possible. The former condition is obtained by making the launder of material that will give a smooth interior surface; the latter, by making it semi-circular in cross section. But such a cross section is difficult to construct of wood, which is by far the best material for the construction of launders, since it readily lends itself to the alterations which are constantly necessary.

A fairly close approximation may be obtained by making the launder rectangular and of a width twice that of the depth of the current. The volume of the liquid affects the velocity, which, other things being equal, varies approximately as $1.25 \sqrt{\text{volume}}$. But in mills, the volume to be used is governed by other factors, such as the amount which can be used on tables. Few mills are so fortunate as to have more water than they need.

In the case of sands and coarse material, it is not possible to use so high a velocity as would be required to carry the material in suspension. The necessary volume or inclination would be too great, entailing an excessive amount of water or an excessive difference of level between the various parts of the mill. Therefore, the coarser particles are usually transported by the second of the two ways mentioned; that is, by pushing and rolling along the bottom.

Now, while the transporting power also depends on the velocity, another more important factor has entered. This is the

*Assistant in Mineralogical Department, Columbia University, New York.

friction between the moving particles and the bottom of the launder. This depends on several factors, such as the inclination of the launder bottom; its smoothness; the shape and size of the particles, and their specific gravity. Round grains will move more easily than flat ones, and both will move more easily on a smooth bottom than on a rough one.

The great importance of this bottom friction can be seen by a very simple experiment which will prove. to anyone who cares to make it, that on a rough bottom coarse sand will move so slowly (with any volume and inclination that is practicable as a method of transport), that, in a mill, for example, it is out of the question.

An example of the character of the motion on such a bottom can be seen in the bed of any brook. Those grains which are temporarily at the top of the ripples are rolled down and come to rest. The grains thus exposed are then in turn moved, the whole mass thus moving forward very slowly.

To obtain the maximum efficiency of a current transporting in this way, the transported particles should move at a velocity which is one-half that of the transporting current. Of course, for transportation by suspension, the particle should move with the same velocity as the liquid.

It will readily be seen that where the bottom friction is so important, as compared with the velocity of the current, it is incorrect to design the launder in such a manner as to obtain the maximum velocity with a given volume, and regardless of its effect on the bottom friction. Usually such a design would entail the use of a bottom so narrow that the material is compelled to pile up on itself, instead of being spread in one layer over the entire bottom. Then conditions become exactly those of a rough bottom, and thus an excessive velocity and volume are required to keep the material moving. In other words, the "scour" is not sufficiently high. At any temporary slackening of the current, motion will cease at some point. This will cause the material just back of this point to pile up somewhat like that in a river delta, thereby diminishing the effective slope of the bottom to such an extent that even a greatly increased velocity is not sufficient to start the material again, and the launder is quickly choked.

In the case of a launder fed by a sand pump, such conditions may be at their extreme and it may then be found impracticable to keep the launder from choking unless the width is sufficent to procure a smooth bottom under all circumstances.

Exact figures obtained by experiment, especially with the irregular flow of a sand-pump launder do not seem to be on record. It is to be hoped that engineers who are in possession of such data may be induced to publish them for the benefit of those working along similar lines.

Crushing Tests of Diamonds Used in Drilling.*

BY ALEXANDER N. MITINSKY.†

Up to a certain limit, the increase of pressure on the diamond-drill increases the rate of progress in drilling. That limit is set by the resistance of the diamonds to compression; and beyond it, the destruction of the stones will involve an economic loss, both in time and money. It is, therefore, important to all diamond-drillers to know what is the resistance mentioned.

In Europe, operators usually follow an empirical rule, which directs the maintenance of a pressure on the area of the bottom of the drilling tool, of 2 kg. per sq. cm. For the tools in ordinary use, this is equivalent to 1 kg. per sq. mm. of the diamonds set in the tool.

So far as I know, American drillers are using pressures as high as 50 to 60 kg. per sq. cm. of the total area of the drill, and the consumption of diamonds (on Denny's authority, 0.2 carats per meter bored) is greater in America than in Europe. But the reason for this difference may be the comparatively larger size of the diamonds commonly used by American drillers.

With the assistance of my friend, the late S. Woisslaw, who was the pioneer of diamond-drilling in Russia, I selected from his stock a number of black diamonds, which I subjected in my laboratory to compression tests.

To prepare regular cubes for such tests, as is generally done with other stones, would have been not only costly, but, what is more important, practically useless. I therefore determined, in order to simulate as nearly as possible the conditions of actual use, to place each sample between a hard plate (corresponding to the rock) and a softer plate (corresponding to the bottom of the tool), into which it would be pressed during the test.

In my first experiment, I placed a diamond between a plate of rolled steel and one of soft bronze, under a very sensitive press, having a diagrammatic recording apparatus, with a maximum load of 1 metric ton. The diamond endured the pressure of 1 ton, and penetrated into both plates without breaking. The area of its impress in the plates could not be determined with any degree of accuracy by ordinary methods; but by taking photographs, enlarging them, and then measuring them with a planimeter, I found the area of the impression in the bronze plate to be 19.5, and in the steel plate, 17.25 sq. mm. The half-sum of these areas, 18.4 sq. mm., being taken as the area of the diamond submitted to pressure, indicates that, under the pressure of 1 ton, exerted by the press, the diamond resisted 54.3 kg. per sq. mm. without breaking.

In my second experiment, I put a diamond (a very small one) between hard tool-steel and rolled soft steel. It broke under 370 kg., leaving on the mild steel an impression of 9.1 sq. mm., and on the tool-steel, one of 3.3 mm. corresponding to breaking pressure per sq. mm. of 45.5 and 115.6 kg. respectively, or an average strength of 80.6 kg.

Subsequently, I compressed three diamonds successively between two pieces of steel of the tensile strength of from 40 to 50 kg. per sq. mm. After these tests, the diamonds were so firmly held in the plates that it was difficult to remove them. The difference of areas of the impressions in the two plates amounted to 8%. The results of the test were:

Experiment No.	Total Load Kg.	Half-sum of Areas. Sq. mm.	Breaking Strength. Kg per sq.mm
3	620	8.0	77.5
4	993	17.5	56.7
5	768	11.0	70.0
Average			68.0

In view of these tests, I think that the pressure on drilling-tools can safely be made heavier, with corresponding gain in speed of drilling. American operators are already in advance of Europeans, but could go even further in this direction.

In Russia, the makers of diamond-tools frequently use a patented method of inserting the stones, which consists in enveloping the diamond in a piece of thin steel; putting it (with some welding-powder) under pressure in the (incandescent) tool; hammering, and then cooling very quickly.

After my tests had been made, Mr. Woisslaw ordered his workmen to leave the danger of breakage out of consideration, and to put upon the diamonds the highest pressure attainable with their machinery. The results were very good. By this method tools can be obtained which will run safely at a peripheral velocity of 25 meters per second.

Two hundred years ago Savory and Newcomen patented the atmospheric engine; and 70 years later Watt and Boulton took up the steam engine together. Their patent expired in 1800. In the days of Newcomen, it took 24 lb. of coal to perform the work which is now done with less than 2 lb.; at the expiration of the patents of Boulton and Watt it took 10 lb. of coal to do this work.

The mechanical efficiency of a large gas engine is greater with a four-stroke cycle than with a two-stroke; this is used as one of the arguments against the two-cycle engine.

*From advance sheets of the *Bulletin* of the American Institute of Mining Engineers for Jan., 1906. Full text. Subject to revision.

†Professor in the Mining Academy of Empress Catherine II, St. Petersburg, Russia.

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THERE HAS BEEN some talk of placing contracts for pig iron in England for import into the United States. The cable, in fact, reports that such purchases have been made. From all accounts, however, the transactions seem to have been only the buying of warrants for speculative purposes. There is no real scarcity of iron here, though buyers cannot always get the deliveries they want.

Labor Troubles at Joplin.

The announcement that the eight-hour law in Missouri (recently decided to be constitutional) would be enforced, led to an attempt to organize a union among the miners of the Joplin district, with a view to securing the old rate of wages of nine hours for the new eight-hour day. During the last week of November there was an incipient labor trouble, something previously unheard of in the district, but it did not amount to much, and through the good sense of the miners and operators matters were promptly adjusted. This was to have been expected in a district enjoying such enviable conditions. It remains to be seen how the law will be enforced and what effect it will have on ore production.

New Ontario.

Northern Ontario—or "New Ontario" as it is frequently called—was, until a few years ago, almost an unknown and unexplored country. Recently, however, the work of railroad engineers, of prospectors and of the geologists of the Province and the Dominion are giving cause for the belief that it is a region of value for its mineral deposits. Attention has been drawn to it by the discovery of the Cobalt district. That district, however, with its remarkable veins of silver-cobalt ore, covers only a limited area. Outside of it there is a good reason to believe that there are deposits of iron ore, copper ore, possibly gold, asbestos, mica and other minerals of value.

Outside of Cobalt, there has been only exploration and prospecting as yet; but these have shown enough to warrant further work, with fair prospects of success. Ontario, which has been regarded heretofore as chiefly an agricultural province (although the copper-nickel mines at Sudbury have been important producers), may turn out to be an significant contributor to the mineral wealth of the Dominion.

Demand for Engineering Services.

The great wave of industrial prosperity at the present time is manifested most prominently in the increased production of the metals and the remarkably high prices for them in the market. A less prominent, but equally significant feature in the mining industry is the unusual activity among the engineers, who report in general an extraordinary demand for their time. This is, of course, an exceedingly satisfactory condition of affairs. It indicates the extent to which investors are entering upon new mining undertakings; and moreover, the increased esteem in which professional services are held. As a dircet consequence of this recognition, the new mining enterprises of the present day will show on the whole a higher percentage of successful results than those of previous periods.

Mining in New Zealand.

The report of the Minister for Mines of New Zealand shows that the value of the mineral production of the colony in 1904 was $17,196,170, against $17,653,270 in the previous year. The gold production in 1904 was valued at $9,937,505, as against $10,189,155 in 1903. The decrease last year was largely due to the long dry summer, which caused suspension of operations at many mines. The silver production last year amounted to 1,094,461 oz., against 911,914 oz. in the previous year. Coal production amounted to 1,537,838 tons, an increase of 117,645 tons.

Although the total production in 1904 showed a decrease in comparison with 1903, it should be remarked that the gold production in 1903 was unusually large, exceeding that of any year since 1871. On the whole, the returns show that the mining industries of New Zealand are in a healthy condition.

The prominent position occupied by gold dredging in New Zealand is shown by the statement that there are 239 dredges in the colony, of which 186 are in regular operation. These give direct employment to 1,300 men.

Quartz mining is carried on throughout New Zealand, the chief centers of production being in Ohinemuri, Thames and Coromandel counties, in the North Island, and Inaugahua county, in the Middle Island. The production of gold is greatest in Ohinemuri county, in which the famous Waihi mines are situated. The output of

the Waihi Gold Mining Company's Waihi mine last year was 259,978 tons of quartz, from which bullion of the value of $3,365,510 was obtained. This company operates mills aggregating 330 stamps, and employs 1,200 men. Dividends amounting to $1,487,720 were distributed during the year. Quartz mining in the other fields is steadily prosecuted, with good returns.

Coal mining shows considerable expansion. There are 168 collieries in operation, and 3,288 men are engaged in the industry. The Westport Coal Company is the largest producer. The output of its mine last year amounted to 534,000 tons. Most of its coal is supplied to the British Admiralty for use of the ships of the China squadron. The Government continues to operate the Seddonville and Point Elizabeth collieries. The total production of these mines last year amounted to 94,000 tons.

Anthracite Coal Supplies.

The question of the extent of the reserves of anthracite coal has been discussed by various experts—and non-experts—since the Anthracite Coal Waste Commission made its report, about 14 years ago. For the most part, the discussion has not been particularly illuminating. Recently there has been a disposition to take rather a pessimistic view, and to talk about the anthracite supply giving out. The origin of this is to be found chiefly in the abandonment of some small collieries in the Wyoming field, where the coal has been worked out. This is nothing new, as similar cases are always occurring; but just now it seems to excite special remark.

In this connection it is well to quote an expert opinion, which bears on the other side. Mr. R. A. Phillips, an operator of long experience, and now superintendent of the Coal Department of the Delaware, Lackawanna & Western Company, this week expressed an emphatic opinion to the Scranton correspondent of the JOURNAL, and his reasons for holding it. To use his own words:

"Coal will be mined in the Lackawanna valley for the next three generations, and then it will not have reached the stage when it will be a luxury. No one can estimate the amount of unmined coal in this section of the region. A small colliery is now and then abandoned, for the reason that all the coal has been mined, but that is no criterion as to the exhaustion of the coal supply; it is an easy matter to work out a small colliery in a few years. But a few years ago some collieries were abandoned, as it was then thought that all the coal that could be mined had been extracted. But with modern equipment and labor-saving machinery, the seams that were then regarded as unprofitable are now being worked. An illustration of this is afforded in the case of the Diamond colliery of the Lackawanna Company, one of the oldest in its system. I can remember when it was accepted as a fact that the three Diamond seams could never be worked at a profit. We are now working those seams, having sunk the shaft for the purpose, and in addition are building a new breaker at the colliery, which, a few years ago, was supposed to be in its last days. We expect that it is good for another 30 years at least."

This touches an important point. Present methods, and especially the utilization of the fine coal, are practically increasing the supply. The proportion of the coal wasted or left in the ground is very much less than when the Anthracite Waste Commission made its report. And this economizing process is not at an end, by any means.

Blast-Furnace Capacity.

The *Bulletin* of the American Iron & Steel Association gives a list of blast-furnaces which have been idle for some time, discriminating between those which are likely to blow in soon, and those which, for various reasons, are not likely to be in use again. The list of those which are likely to resume soon includes 17 furnaces; total annual capacity, 601,500 tons of pig iron. Of the total, eight stacks, with an annual capacity of 435,000 tons, use coke for fuel; seven stacks, with an annual capacity of 92,500 tons, use charcoal; one stack, with an annual capacity of 38,000 tons, uses anthracite coal and coke mixed; and one stack, with an annual capacity of 36,000 tons, uses anthracite coal alone.

The number of furnaces practically dead is 39; total annual capacity, 1,197,600 tons. Of the total, 16 stacks, with an annual capacity of 629,000 tons, used coke for fuel when last in blast; 11 stacks, with an annual capacity of 448,500 tons, used anthracite and coke; and 12 stacks, with an annual capacity of 120,100 tons, used charcoal.

On this list the *Bulletin* comments as follows: "As stated in the last issue of the *Bulletin* there were a large number of blast-furnaces in this country which had not made pig iron from June 1, 1904, to Nov. 1, 1905. The annual capacity of these idle furnaces we then estimated at not less than 1,500,000 tons. We have since ascertained that 17 stacks, with an annual capacity of 601,500 tons, have resumed operations since Nov. 1 or are preparing to resume at an early date, and that 39 stacks, with an annual capacity of 1,197,600 tons, are not likely to resume work in the near future.

"The blast-furnaces which are now being built, and which are to be ready for blast in January, February, March, and April, 1906, as mentioned in detail in our last issue, will have an annual capacity of 915,000 tons. If to this capacity we add the 601,500 tons above mentioned, we will have 1,516,500 tons of additional blast-furnace capacity that will probably be available by the end of May, 1906. If to this capacity we add the 28,635,000 tons reported in our last issue for the whole country, it will be found that within the next six months we will have an available capacity of at least 30,151,000 tons of pig iron. This capacity, making due allowance for furnaces necessarily idle, should be sufficient to supply all demands for pig iron in the period mentioned."

There is now no doubt that the actual production of pig iron in 1905 will exceed 23,000,000 tons. In 1906, from present indications, even this great quantity may be exceeded. Taking the figures given above, and making allowances for furnaces under repair—and a certain average must always be in that condition—the capacity for next year will be between 26,000,000 and 27,000,000 tons. This should suffice to meet any likely increase in demand. It is the coke and ore supply, not furnace capacity, that will limit the output of pig iron in the coming year.

Coal-Mine Accidents.

The article on "Coal-Mining Accidents"—to which we gave considerable space in a recent issue—is, as previous papers on the same subject have been, a thorough and careful study of this important subject. The author, Mr. F. L. Hoffman, has been engaged for a number of years in the investigation of the risks to life incident to various occupations. He

is a master of the use and application of statistics, and his clear arrangement of the facts and his comments on the results presented leave little to be added here. The article is a sufficiently severe arraignment of our coal-mine management, and incidentally of our coal-mining laws. In more than one of the States, these are either insufficient, or they have been made contradictory and obscure by amendments and alterations which were perhaps well meant, but ill considered. In Pennsylvania, the greatest coal mining State, Mr. James E. Roderick, chief of the Bureau of Mines, has strongly and ably urged a thorough revision of the mining law, with a view of forming it into a consistent and coherent code. In West Virginia Mr. James W. Paul, the State mine inspector, has repeatedly shown the necessity of amendments to the mining law. In Iowa and other States such action has been advised by the responsible officers; but legislatures are slow to act, at any rate in an intelligent way.

In many cases the enforcement of the law is better than the law itself. We are quite safe in saying that the great majority of the State and district mine inspectors are competent and hard-working men. In some cases they are hampered by insufficient authority; in others they are given too much territory to enable them to do the work properly. As a rule, however, there is far less fault to be found with mine inspection than with many other branches of the public service.

The two more prominent causes of coal-mine accidents are falls of roof and gas explosions. The latter can be dealt with in two ways, by ventilation and by the proper use of the safety-lamp. In most States the ventilation is regulated by law, though these laws in some cases leave much to be desired; and many explosions are the result of defective air supply. More, however, are due to improper use of lights, and in these cases the miners are more often at fault than the mine management.

Although explosions of gas are apt to draw more attention, since one such accident may kill a number of persons, many more deaths are due to falls of roof. Here there is need of much stricter regulation than now exists. It is true that many such accidents result from the carelessness of miners, who will not take the time for proper precautions; but a large number are due to the neglect or parsimony of mine operators who do not supply safe or sufficient timbering; and of superintendents who do not attend closely enough to keeping up the timbering as the work advances. Better laws, strictly enforced, are needed to prevent this class of accidents. They are difficult to deal with, indeed, and the law must be framed by experts to do the proper service.

Indeed, there are engineers of experience who, knowing that it is impossible to provide for all contingencies, claim that the best mining law is the simplest; and that a provision for heavy damages for loss of life or injury would be the best preventive of accidents. It is a fair subject for argument.

Local Experience in Mining.

Many large losses that have been experienced in mining and metallurgical enterprises are directly traceable to imperfect study and disregard of local experience, *i. e.*, the practice that has been evolved in the particular district as the result of gradual, and usually timid and tentative experimentation. The practice may appear defective and backward to the newcomer, experienced in other districts, and he is prone to jump at the conclusion that it can be improved. This is frequently the case; but also it is frequently the case that the apparently defective and backward practice has a reason for its status, and the attempt to improve it fails because of unknown or misunderstood conditions not taken into account.

Thus, in the Joplin district, Missouri, the mining and milling methods six years ago were apparently very crude. Their crudity impressed itself strongly on engineers visiting the district in behalf of outside capitalists who became interested there at about that time. Improvements based on experience in other mining districts were promptly determined upon, and were carried out, with unsuccessful results because of failure to recognize the peculiar conditions and the fact that the local practice had been developed in conformity with them. Since that time many improvements have been consummated in the district; and engineers with experience gained elsewhere have been considerably instrumental in effecting them. Their usefulness has been, however, in applying outside experience to that gained by practically working in the district itself, affording a thorough knowledge of its peculiar conditions.

Errors of this kind are ascribable to two causes: (1) imperfect study of the local conditions; and (2) wilful disregard of them. The local conditions may, indeed frequently do, involve some subtle factors, such as characteristics of the miners and mill-men, which can be understood only by thorough acquaintance with them; or features of climate which may not be properly appreciated in a brief experience; or misconception of the character of the ores, the nature of the deposits, and the markets in too brief a study. Wilful disregard of the local conditions, on the other hand, implies no study of them at all. Examples of such mistakes are to be found in almost every mining district. Plants are erected on the designs and specifications of engineers, who have never been in the district, or have gone there only to examine the topography of the ground. Plants are erected to try some new scheme, as, for example, a concentrating mill with fine crushing and tables in a district where the experience of 30 years had demonstrated the efficiency of coarse crushing and jigging; of the erection of Joplin mills in districts where experience had shown the necessity for closer treatment of the ore. All of these experiments were, of course, failures.

Every district in which mining and milling is practiced for a considerable period of time develops a local experience in the extraction and treatment of its ores, which is strictly in conformity with the conditions, because the conditions themselves to a large extent establish the experience. Improvements are made as experience is gained, usually as the result of experiments tried cautiously and tentatively, always with a path for retreat. The local practice may be defective and capable of immediate improvement; but the engineer who undertakes it must be sure of his ground. He should not disregard the local practice because of its apparent inefficiency, but should examine and study the causes which have determined it. These will often be found to present good reasons for what has been developed. It is lack of appreciation on the part of the engineer in this respect that has caused the weary investor many a time to turn finally to some local miner as the "good practical man" that he hopes will be his Moses.

Metallics.

In developing a mine, it should be borne in mind that unnecessarily large openings for shafts and galleries mean not only the breaking and handling of needless material, but also increased expense in maintenance, which is an important consideration in heavy ground. On the other hand, large excavations are relatively easier and cheaper to make. The size of the opening should be, therefore, ample to serve its purpose, but not larger than necessary for economy in operation.

The Edison "giant rolls" at Dunderland, Norway, are 7 ft. in diameter and 7 ft. width of face. They are designed to crush pieces of rock up to eight tons in size. Rolls of this type were first installed by Mr. Edison at his iron mine at Ogden, N. J. They were subsequently put in the Edison Portland Cement Co.'s plant at Stewartsville, N. J. They have been in use for about five years at the magnetic separating plant of the New Jersey Zinc Co. at Franklin Furnace, N. J., where the first set of rolls is 5 ft. in diameter.

Aluminum skimmings are unlike those of any other metal. Brass skimmings are finely divided, and the shot and other pieces of metal are easily sieved out. Aluminum skimmings, however, are of an entirely different nature, and consist of a small amount of oxide of aluminum mixed with a larger quantity of metal. When a crucible is skimmed, the oxide and metal are removed in the form of a pasty mass. The skimmings consist principally of metal, and the loss in melting is far in excess of that of most other metals.

The forebay leading to a turbine water wheel should be supplied with two trash racks as a precaution against anything being fed to the wheel but water. Solid chunks of wood often slip through undiscovered breaks in the rack, and a slat is liable to break or become loose at any time, night or day, and not be noticed until the mischief is done. With two racks the danger is lessened because both are not liable to be broken at the same time, if due diligence is exercised in watching them. The second rack also serves to screen the opening when the first is raised for cleaning.

Adulteration of graphite may be detected in the following way: By shaking in a test tube about a quarter of a gram of graphite powder mixed with 15 c. c. of acetone, and allowing to stand 10 or 15 min., it will be observed that pure graphite settles clear leaving the liquid colorless; coke dust imparts a gray color to the solution and remains in suspension a long time; anthracite dust imparts a faint brown color and settles more rapidly, while soft coal dust imparts a deep brown color to the acetone. Equal parts of glacial acetic acid and sulphuric ether answer as well as acetone for such a test.

When steam is piped directly from a boiler into drill, practically the same number of cubic feet of steam are consumed as of cubic feet of compressed air. One cubic foot of free air is equivalent to 0.035 lb. of steam at the same pressure of 75 lb. per sq. in. If a drill consumes 6,000 cu. ft. of free air per hour, it would therefore consume 210 lb. of steam in the same time. One cubic foot of steam at 75 lb. gauge pressure contains eight times as much heat energy as one cubic foot of air at the same pressure. This shows why compressed air is more economical than steam in spite of all the losses involved in its production.

In the shipment of fine concentrates, care must be taken to avoid loss in transit, which may amount to a considerable item, especially if the ore be high grade. On this account, sacking is often resorted to, but this adds a large charge to the cost of handling the ore. Sacking is likely to come to $1 to $2 per ton of ore. In shipping in bulk care must be taken to secure a box-car that is tight and otherwise in good condition. One large shipper of concentrates lays a canvas in each end of the car, on which the ore is piled, the edges of the canvas being turned up all around. The ore is, therefore, practically shipped in two large sacks per carload.

A large proportion of the accidents due to defective pipe work is to be traced directly to poorly cut threads and the practice of making them of insufficient depth. It is not uncommon to find blow-off pipes and other connections made up to a depth of only two or three threads. They may be made steam- and water-tight; but, considering the strains they have to bear, so slender a hold is far too insecure for safe reliance. Pipe is often sent from the manufacturers in such shape that it is almost out of the question to make up a joint of more than one or two threads without recutting, and this too, in the face of a generally accepted standard to which all the makers are supposed to conform.

A gasoline locomotive for mining work has recently been built for the Britannia Copper Mining Co., of Vancouver, B. C. A 35-h.p. vertical four-cylinder engine, as used in automobiles, drives a shaft with gearing for two speeds (two and five miles an hour) either forward or backward. A bevel pinion on the transmission shaft engages with two bevel spur wheels, each carrying a friction clutch, through which passes a 3-in. shaft. From this shaft one of the axles is driven by a chain. The ignition is on the jump-spark system, and the exhaust gases are discharged into a water tank to absorb the odor and deaden the sound. The machine weighs about eight tons, and can haul a 60-ton train at five miles an hour.

A good way to line up a simple engine is to stretch tightly a fine piano wire through the center of the cylinder of the engine, and make all measurements from this. Another wire may be stretched at right angles to it, parallel with the shaft. This right angle can be determined by the familiar 3:4:5 triangle; or, if the shaft is short, compared with the length of the engine, by a triangle having the ratio 5:12:13. The cylinder and guides can be lined up directly from the first wire, and the bearings for the main shaft can be adjusted until they are parallel with the second wire. Of course, if a transit is available, the time and trouble required can be considerably reduced by its use.

It used to be thought that a diamond-drill boring, started vertically, continued downward in the same line, but the failure to find bore holes, in subsequent mining, at the position mapped, showed that the holes were subjected to large deviations from the vertical. A remarkable instance of this was reported in connection with the borings on the property of the Turf Mines, Ltd., near Johannesburg, Transvaal. In one hole, the South Reef was assumed to have been struck at a depth of 4,802 ft., that being the total distance drilled, computed vertically. A survey of the bore-hole showed, however, that the reef had actually been struck at a point 2,185 ft. away from the vertical, and at an actual depth of 3,910 ft. below the surface. Another bore-hole on the same property, supposed to have encountered the reef at 4,742 ft., actually cut it at depth of 3,745 ft. and 2,175 ft. away from the vertical line on which it was started.

The perch of masonry is a unit of measurement which has fortunately disapeared from practice to a large extent, but it is still employed in some localities. In any case the only safe provision is to specify how many cubic feet the perch is supposed to contain, and when that is done there is no reason why the perch should be mentioned at all, except in deference to local custom. There is no recognized official perch of masonry. In Oklahoma, North Dakota, South Dakota and Ohio, it is fixed at 25 cu. ft. of stone. In Delaware it is 24¾ cu. ft. in walls, 27 cu. ft. when piled on the ground, 30 cu. ft. when in a boat, and 30½ cu. ft. in cars. In Colorado a perch of stone in mason work is 16½ cu. ft., and for brickwork measure laid in a wall, 22 bricks per cu. ft. for a foot-wall and 15 bricks for what is known as an 8-in. wall. In Philadelphia 22 cu. ft. is considered a perch. Four reliable handbooks define a perch of masonry as 16.5 by 1.5 by 1 ft., or 24.75 cu. ft. Trautwine says: "A perch of masonry actually contains 24¾ cu, ft.. being 16½ by 1½ by 1 ft. It is generally taken at 25 cu. ft., but by some at 22 cu. ft., etc., and there is every probability that a payer will be cheated unless the number of cu. ft. be distinctly agreed upon in the contract." The fact, however, that most tables of measures refer to a perch as 24¾ cu. ft. would lead to the belief that such is the generally accepted standard.

Colliery Notes.

Cannel coal has a sp. gr. of 1.229 and produces about 48% of coke. The volatile matter is extremely high, and its oily nature is strongly marked.

Youghiogheny gas coal has a sp. gr. of 1.280 and produces about 64% of coke. Its composition is as follows: Moisture, 1%; volatile matter, 35%; fixed carbon, 58.07%; sulphur, 0.33%; ash, 5.60%.

Briquets made from bituminous slack make less smoke in burning than ordinary bituminous coal. A great drawback, however, is the creosote contained by the pitch employed as binder, which produce an acrid dust and fume.

Slack from coals rich in bitumen will work into briquets with an addition of 2 or 3% of pitch, while leaner grades may require as much as 10%. If the cost of pitch be high, the requirement of 10% may render briqueting unprofitable.

The collieries in the Connellsville district, Pennsylvania, average 7 ft. of mining coal, leaving some coal in the roof and floor for better protection of the mine. In good mining practice there is recovered 80 to 85% of the estimated content, wherefore a 7 ft. seam should furnish about 9,000 tons per acre.

A breaker for bituminous coal at Stockett, Mont., having a capacity for 3,200 tons per day, cost $42.517.90, divided as follows: General expense, $472.45; foundations, $2,445.46; lumber, $3,607.31; machinery, $12,764.89; separators, $2,753.18; weighing scale, $123.75; hardware, $805.91; labor, $10,700.82; freight, $8,844.13.

A single oven in a battery of bee-hive ovens frequently gives a yield of 70% of merchantable coke, while the battery as a whole gives only an average of 63%. It is therefore unsafe to deduce conclusions from the results of one or two ovens selected from a battery for purpose of test, unless the particular conditions be carefully determined.

In coking coal in bee-hive ovens, the percentage of ash in the product is increased by the combustion of coke that is wastefully permitted by bad management. The yield of coke is diminished in this manner and the grade of the product is deteriorated. Cases have been noted in which the consumption of coke was sufficient to add 4% of ash to the entire product.

The lignite beds in North Dakota vary in thickness from 1 in. to 40 ft. This maximum thickness (which was carefully measured in the summer of 1902) outcrops in connection with the lignite on the Little Missouri river. Three beds which reach a thickness of 25 ft. are known, while beds 15 ft. thick are not uncommon. In the western part of the State, beds 2 and 3 ft. thick are quite common.

Foreign coal buyers are paying increasing attention to the chemical composition of coals; they base the value in large contracts on the results of chemical analysis of average samples. The Japanese Government has a fixed minimum limit of ash, and penalizes any infringement thereon. French and English buyers of large quantities of coal frequently insist upon similar conditions.

There are no theoretical considerations to support the rather common notion that at greater depths a higher grade of coal exists. The analyses of the coals found by the railroads in the deep drillings undertaken in the western part of the State of North Dakota have not been published. But this work was done some years ago, and since no development work has followed it, the inference seems fair that bituminous coal in significant quantities was not found.

According to R. V. Norris, the cost of the water-hoist at the William Penn colliery was $10.7 per 1,000 gal. daily capacity. The cost of the water-hoist at the Lytle colliery was $9.87. Cost of shaft and steam plant is excluded in each case. Both of these colleries are in the anthracite region. The William Penn hoist has capacity for 2,100,000 gal. per 24 hours from a depth of 953 ft. The Lytle hoist is of 3,750,000 gal. daily capacity from a depth of 1,500 ft.

Picking belts employed for cleaning coal are generally 4 ft. wide, and travel 30 to 60 ft. per min. According to John Fulton, in picking coal of sizes from 1.5 in. upward, at the rate of 30 tons per hour, belts should be 15 ft. long, plus 10 ft. additional for each 3% of material picked out. For sizes from 0.75 to 1.5 in., the belt should travel 30 ft. per min., and for 20 tons capacity per hour, 15 ft. length of belt is required for each 1.5% of material picked out. If these sizes contain more than 6% of impurities, it is generally preferable to treat them by washing.

The quantity of water pumped at the Short Mountain colliery, Dauphin county, Pennsylvania (anthracite region) ranges ordinarily from 2,000 to 4,000 gal. (7.5 to 15 tons) per ton of production, but in wet months it has been as high as 8,000 gal. (30 tons) for each ton of coal shipped. The consumption of coal for pumping is in ordinary years about 15% of the shipments from the colliery, but in 1902 it was 40%. The cost of pumping in the latter year was 4.16c. per 1,000 gal., the average vertical lift being 1,093 ft. At the Hazleton plant of the Lehigh Valley Coal Co., with 5,000,000-gal. pumps, the cost is said to be about 1.25c. per 1,000 gal. for 560 ft. vertical lift. This is one of the highest-grade pumping plants in the anthracite region.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Mining Geologist and the Mining Engineer.

Sir—With the development and specialization of all branches of science, the broad field of geology has been subdivided for workers of different interests, and mining geology has become recognized as a specific division.

The services of the mining geologist are now employed by capitalists to study the possibilities of undeveloped territory in mines already opened, and to determine the probabilities of prospects wholly undeveloped. In his special capacity, this field of the work of the mining geologist is wholly distinct from that of the mining engineer; although the latter is often a good geologist, and the former is frequently a trained engineer. The principle function of the mining engineer, however, is more in the line of administrative work in the technical and financial management for the exploitation of mineral deposits.

The function of the geologist is to read the story of the rocks, to note their promise and the probability of its fulfillment, and to determine what possibilities the classified facts of geologic science may bring to light beyond those bare realities which have been touched with the hand, measured with tape and transit, or proven with the diamond drill. As the business of mining becomes more scientific it is realized that ore deposits do not always conform to the stereotyped cuts in the older text-books, and that many rich mines exist without any semblance whatever of a true vein.

It therefore becomes necessary for the geologist to discuss the commercial probabilities of novel phases of mineralization; and with his special training and experience in observation, to endeavor to advise the capitalist as to the safety of a proposed venture. In most mining regions the more ordinary types of deposits are the first to be developed, the unusual or obscure types being more likely to lie unopened; or, if opened and found unproductive at the outset, to be abandoned without persistent exploration.

As the demand for metals increases, the neglected prospects become more interesting to capital, and are subjected to more searching investigation to discover, if possible, deposits of workable value.

The geologist's report being received, it often happens that the investor is anxious to make assurance doubly sure; and, to seek confirmation of the geologist's report

if it be favorable, he submits it to a mining engineer. The engineer has perhaps never seen the ground, is not an expert geologist, and is honestly conservative. Not having seen the evidence, he feels in doubt as to the certainty of the conclusions; hence, to protect himself, he may give a verdict of "not proven" in regard to the geologist's predictions, whereupon the prospective investor decides to button up his pockets.

The argument to be deduced from such a situation is that the investor should know or be warned at the outset, that the geologist's report on undeveloped ground may not, even if favorable, reveal any facts that, without exploration, will stand the test of engineering criteria, since no evidence may exist which falls within the field of engineering criticism. In order to receive such a warning intelligently he should know, or have explained to him, the difference between the data of geology and those of engineering. It should also be understood that the mining engineer, if he be also a trained mining geologist, in reporting on prospects or undeveloped ground, is reporting as a geologist on the geologic features and not as an engineer on engineering matters. Likewise, when the geologist measures bodies of ore already developed, he is dealing with matters of engineering.

As examples of geologic promises not amenable to engineering criteria, the writer would instance some cases observed in a recent trip through central Sonora, which has many novel types of mineral deposits.

Within a half day's ride of Minas Prietas is an abandoned mine, which at one time was very profitable. In a country of rhyolite is a strong quartz vein in which was found and worked a shoot of rich silver ore, which is tetrahedrite in blende, carrying value up to thousands of ounces. Specimens of the ore extracted were obtained for assay, and records from a local ore buyer corroborated the indications of high value in the ore shipped. The mine itself, abandoned by the owners, for some time had been occupied by "Gambucinos," and consequently stripped of almost every fragment of ore large enough to carry away. Here and there, in the sides of the drifts and stopes, the vein (which had a very gentle dip) carried remnants of tetrahedrite and blende rich in silver.

From the engineering standpoint the mine was worked out and there was no ore in sight. From the geologic standpoint there was a well developed vein which had yielded one very rich ore-shoot, and the probabilities, in every way, favored the finding, by proper exploration, of another ore body of commercial value. It seemed a legitimate mining risk, but the evidence was wholly geologic. The question for the investor was, whether or not he would accept geologic advice so far as to investigate.

As another example may be cited a prospect near the eastern border of the Altar district. The country rock was a gneiss, and along a narrow shear zone mineralization had occurred to such an extent that specimens taken near the surface assayed $30 per ton in gold. After a shaft had been sunk some 20 feet and some exploratory drifting had been done, it was found that the values lessened in depth and became quite nominal. Here, there being no true vein or other evidence of vigorous chemical action, it was impossible to say that commercial value would be found at any lower point. The rich ore near the surface was considered as possibly due to some form of secondary enrichment, or concentration by surface water, and it did not appear that any definite geologic promise existed. It was apparently a gambling proposition.

A third case will suffice to make the writers' point. In the Magdalena district is an area of granite, cut at many points by quartz veins and associated with andesite dikes. The veins are of hard white quartz, with very small values in gold; but, associated with these veins are rich stringers, irregular in form, carrying galena and other minerals high in gold, and without any apparent systematic relation to the vein. Here is a case where a well developed vein is worthless according to ordinary standards; but the very rich stringers irregularly penetrating the country rock constitute an abnormal type of deposit which may yield a rich reward to one possessing the requisite enterprise to spend money in development.

The commercial question, which neither geology nor engineering can solve without a practical test is, whether these rich stringers can be found in sufficient size and number to yield a profit in the face of the dead work which might have to be done in finding them. The geologic promise of their existence is ample.

These remarks are offered, not so much to experts as to the men who employ them; but, as the subject seems worthy of discussion, some light may be thrown on a matter which is often confusing.

F. J. H. MERRILL.

New York, Nov. 25, 1905.

Standardization of Ferrocyanide with Respect to Zinc.

Sir—The abstract of a paper on this subject, by E. M. Johnson, published in this JOURNAL (Oct. 28, 1905, page 780) has only recently caught my attention. I should like to state that it is not quite clear to me why Mr. Johnson elaborates all his average constants for the various weights of zinc taken. From these careful data, he only suggests a workable table for the easy and direct reading of percentages. Why not (as is the custom here and elsewhere for accurate work) deduct the blank from every reading of the burette? Taking all Mr. Johnson's figures, the blank averages about 0.37 c.c. Under exactly similar conditions, this amount of ferrocyanide is run into all assays before the end color-reaction is attained.

If we deduct the blank, the remainder will give a constant for all weights of zinc titrated. This is shown in the table given herewith.

Figures from Johnson.			After Deducting Blank of 0.37 c.c.	
Mg. Zinc.	Av. Constant.	Corresponding to c.c. Ferrocyanide.	Corrected c.c.	Corrected Av. Constant.
30	.00894	3.35	2.98	.01007
40	.0092	4.35	3.98	.01005
150	.0098	15.30	14.97	.01002
250	.0100	25.00	24.63	.01009

By making the solution a shade weaker, the burette reading, less the blank determined by the operator under his own set of conditions, may be made to give the percentage of zinc.

F. C. ROBINSON.

Chemist, Sheffield Smelting Co.

Sheffield, England, Nov. 14, 1905.

"Control of Fire in Sulphide Ore."

Sir—I have read with considerable interest the article on "Control of Fire in Sulphide Ore," by W. M. Seamans, recently appearing in this JOURNAL (Nov. 11, 1905, p. 865). The reference to the fire in the Iron Mountain mine was particularly interesting to me, as I was connected with the management of the mine at the time of the first discovery of the fire, and I am familiar with the means there employed in the efforts to subdue it.

The article referred to states correctly that the subjugation of the fire at Iron Mountain was due to the installation of a system of positive ventilation; but in giving Joseph J. Shaw the credit for having introduced the method there, an error has crept in. The system of fan blowers established there was designed by the general manager of the Mountain Copper Co., Lewis T. Wright, after he had carefully studied the physical condition of the settled broken ore, and the overburden. I was superintendent of the mine at the time, and I made the installation, under the direction of Mr. Wright.

I am sure that this JOURNAL will be glad to recognize this correction.

C. F. NOURSE.

San Francisco, Nov. 25, 1905.

Cribbing is the simplest form of timbering for small shafts, and often it is the cheapest; but in large shafts it is cumbersome and expensive.

The square-set system of timbering for mines was developed by Philip Deidesheimer, at the Ophir mine, Comstock Lode, Nevada.

New Publications.

Poor's Manual, Vol. 38. Pages, 1,620 + 13; 6 by 9 in., cloth, $10. New York, 1905. Poor's Bureau.

De l'Anémie Ankylostomiasique de Mineurs. By Dr. A. Manouvriez. Pages, 26. 6 by 9 in.; paper. Paris, 1904: Jules Rousset.

Proceedings of the American Institute of Electrical Engineers; Vol. XXIV, No. 11; pages, 58 + xxvi; illustrated. 6 by 9 in.; paper; 50c. New York, 1905: American Institute of Electrical Engineers.

Contents.—Lightning-arresters on transmission lines; air-gap flux in induction motors.

Annual Report of the Chief of Engineers, United States Army. Pages, 752. 6 by 9 in.; paper. Washington, 1905: Government Printing Office.

Contents. — Fortifications. Engineer depot, Washington Barracks, D. C. Engineer depot, Leavenworth, Kan. River and harbor improvements. Supervision of the harbor of New York. California débris commission. Commission of congresses of navigation. Bridging of navigable waters. Bridges obstructing navigation. Bridges at Washington, D. C. Washington aqueduct. Northern and northwestern lakes. Yellowstone National Park. Government printing office building. Erection of statue of Frederick the Great. Road into Mount Rainer National Park. Index.

Jahrbuch der Chemie for 1904. Vol. XIV. Edited by Richard Meyer, assisted by H. Beckurts, Brunswick; C. A. Bischoff, Riga; Alfred Cohen, Göttingen; M. Delbrück, Berlin; J. M. Eder, Vienna; Th. Fischer, Berlin; P. Friedlaender, Vienna; C. Haeussermann, Stuttgart; A. Herzfeld, Berlin; W. Küster, Tübingen; J. Lewkowitsch, London; A. Morgen, Hohenheim; F. Quincke, Levergusen; and A. Werner, Zürich. Pages, 589. Size, 6 by 9½ in.; paper. $4.25. Branschweig, Germany, 1905: Frederick Vieweg und Sohn.

This condensed abstract of chemical progress for 1904 comes with commendable promptness, especially considering its source. Of 17 chapters, only a few cover material which is allied to our special profession. Some of these are: Chapter I, physical chemistry, 64 pages, by Alfred Cohen; II, inorganic chemistry, 54 pages, by A. Werner and P. Pfeiffer; VIII, metallurgical, 56 pages, by Th. Fischer; IX, explosives, 14 pages, by C. Haeussermann; and chapter X, inorganic industrial, 17 pages, by F. Quincke. These comprise much information, which is given in convenient form for those who read their German.

Proceedings of the Chemical, Metallurgical and Mining Society of South Africa. Vol. 3. Pages, 483. Illustrated. Size, 5½x8 in. Cloth. $6. Edinburgh, R. W. Hunter; New York, The Engineering and Mining Journal.

Contents.—Notes on the Analysis of Cyanide Solutions, by Andrew E. Crosse. Notes on the Treatment of Slimes, by Means of Filter Presses, by Clement Dixon. The Smelting and Refining of Zinc-gold Slimes, by E. H. Johnson and W. A. Caldecott. A Slight Improvement in the Extractor Boxes, by S. B. Hutt. An Improved Washbottle for Quantitative Work, by E. H. Weiskopf. Residual Products of the Dynamite Factory and Their Value to the Gold Industry, by W. Cullen. The Thermo-hyperphoric Process, by A. T. Firth. Notes on Valuing a Gold Mine, by T. Lane Carter. Notes and Queries, by H. T. Durant. The Lead Smelting of Zinc-Gold Slimes, by P. S. Travner. Notes on Mine Sampling of the Main Reef Series, by D. J. Williams. Furnaces, the Economic Use of Petroleum. Oil Gas as Applied to Smelting, Laboratory Work and Drill Heating, by David Laird. The Theory of Miss-fires and some Conclusions of Practical Value, by E. H. Weiskopf. Commercial Notes on Cyanide of Potash, by A. Whitby. Miners' Phthisis, Some Notes and Suggestions, by W. Cullen. The regeneration of Working Cyanide Solutions, where Zinc Precipitation is used, by Andrew E. Crosse. Notes on the Common Practice of Quartz Milling on the Rand, by Fraser Alexander. Extraction of Gold from Cyanide House Slimes by a Wet Method, by John Fleming. An Automatic Sampler for Tailings, Sands and Slimes, by C. H. Pead. The Refining of Lead Bullion, by F. L. Piddington. A Few Remarks on the Banket Formation, by A. R. Sawyer.

Radio-Activity. Second edition. By E. Rutherford (professor of physics, McGill University, Montreal). Pages, 580; illustrated. 5½ by 8½ in.; cloth, $3.50. Cambridge, England, 1905: The University Press.

This book is at once the most exhaustive and the most authoritative manual on this subject in English. The first edition bore the editorial date of February, 1904, and this one bears that of May, 1905. The new edition contains nearly 200 pages more than the first; while all of it has been revised, yet there are several new features, some of them are: Three new chapters on the transformation of radium, thorium and actinium, respectively. The "disintegration theory" has been much expanded. The nature of the emanations has been much elaborated. The magnetic relations of "ions" (which are not necessarily identical with "solution ions") have been extended. Two appendices have been added on the "alpha rays."

It is impossible to discuss the contents of this book in detail; but it should be noted that Professor Rutherford has not only done full justice to the work of Monsieur and Madam Curie, of Strutt, of Ramsay and Soddy, of Runge, and a score of others, in a happy union of the editorial art of condensation and critique; but he has also himself given no insignificant contribution in his own research. Indeed, it is this feature of the book which makes it as unique as it is timely; it is written by one who is himself the leading authority on the subject this side of the water. The general make-up of the book is admirable. But we would suggest that in this busy age it would be a courtesy to the reader if a concise five-page outline of the whole subject were added, bringing the entire results up to date in a brief abstract. The short time intervening between the two editions speaks clearly, both for the activity of research on radio-activity and also for the keen interest therein shown by the public.

Professional Papers.

Neuere elektrische Stossbohrmaschinen. By W. Wolf. *Osterreichische Zeitschrift für Berg- und Hüttenwesen,* Nov. 18, 1905. Pp. 603-606, with cuts.

Beiträge zur Chemie und Mechanik von Rettungsapparaten. By Dr. L. Michaelis. *Zeitschrift für das Berg-, Hutten-, u. Salinen-Wesen,* LIII, 1905, 3, pp. 325-337.

Unfälle in elektrischen Betrieben der Bergwerke Preussens im Jahre, 1904. From official sources. *Zeitschrift für das Berg-, Hutten- u. Salien-Wesen,* LIII, 1905, 3, pp. 337-343.

Die Südlichsten Gangaufschlüsse im Maria-Grubenfelde der k. k. Bergdirektion Pribram. By Hugo Stefan. *Osterreichische Zeitschrift für Berg- und Hüttenwesen,* Nov. 18, 1905. Pp. 597-599, with cuts.

Mitteilungen über einige der bemerkenwertesten Explosionen beim preussischen Steinkohlenbergbau im Jahre 1904. From official sources. *Zeitschrift für das Berg. Hutten. u. Salinen-Wesen.* LIII, 1905, 3, pp. 344-358.

Iron-Nickel-Manganese-Carbon Alloys. By H. C. H. Carpenter, R. A. Hadfield and Percy Longmuir. Seventh report of the alloys research committee of the Institution of Mechanical Engineers, Nov. 17, 1905. Published in *Engineering* (London) Nov. 24, 1905, pp. 708-713; and to be continued.

Die Karbonformation Schlottland's und die Dauer der dortigen Kohlenvorräte. By B. Simmersbach; being a translated abstract of the first and last chapters of "The Coal-Fields of Scotland," by Robert W. Dron, *Zeitschrift für das Berg-, Hütten- u. Salinen-Wesen,* LIII, 1905, 3, pp. 310-324.

Genesis of Lake Superior Iron Ores. By Charles Kenneth Leith. *Economic Geology,* I, 1, pp. 47-66.

Ore Deposition and Deep Mining. By Waldemar Lindgren. *Economic Geology,* I, 1, pp. 34-46.

The Present Standing of Applied Geology. By Frederick Leslie Ransome. *Economic Geology,* I, 1, pp. 1-10.

Secondary Enrichment in Ore-Deposits of Copper. By Prof. James Furman Kemp. *Economic Geology,* I, 1, pp. 11-25.

Uber die Nachmalung der Sände auf der Great Fingall Consolidated mine. By C. Göpner, Hamburg. *Metallurgie,* II, 1905, Nov. 22, pp. 529-535.

The Chemistry of Ore Deposition—Precipitation of Copper by Natural Silicates. By Eugene C. Sullivan. *Economic Geology,* I, 1, pp. 67-73.

Beiträge zur Ventilatorenfrage. By Prof. Baum, Berlin. *Zeitschrift für das Berg-, Hutten- u. Salinen-Wesen,* LIII, 1905, 3, pp. 454-502. Illustrated.

Hypothesis to account for the Transformation of Vegetable Matter into the Different Grades of Coal. By Marius R. Campbell. *Economic Geology,* I, 1, pp. 26-33.

Notizen von einen metallurgischen Studienreise durch die Vereinigten Staaten von Nordamerica. By Prof. Pufahl, Berlin. *Zeitschrift für das Berg-, Hutten- u. Salinen-Wesen,* LIII, 1905, 3, pp. 400-453.

Occurrence of Albite in the Bendigo Veins. By Waldemar Lindgren. *Economic Geology,* I, 2, pp. 163-166. The unusual presence of feldspar in gold-quartz veins has been noted also in California and Douglas Island.

Structural Features of the Joplin District. By C. E. Siebenthal. *Economic Geology,* I, 2, pp. 119-128. Illustrated. A study of faulting in the Cornfield region, which throws light upon the geological history of the district.

The Quicksilver Deposits of Brewster County, Texas. By William B. Philips. *Economic Geology,* I, 2, pp. 155-162. Illustrated. Description of the geology, the occurrence of the ores and the smelting processes employed.

The Phase Rule and Conceptions of Igneous Magmas—Their Bearing on Ore Deposition. By Thomas Thornton Read. *Economic Geology,* I, 2, pp. 101-118. An application of Gibbs' phase-rule to the discussion of magmatic segregation.

Uber die mit den verschiedenen Schachtleitungen im Oberbergamtsbezirk Breslau gemachten Erfahrungen. By Ackermann, mine assessor of Zabrze. *Zeitschrift für das Berg-, Hutten- u. Salinen-Wesen,* LIII, 1905, 3, pp. 325-399. Illustrated.

Versuche zur Festellung der Verluste an Silber und Kupfer beim Verblasen von Kupferrohstein auf hochkonzentrierten Kupferstein und beim Verblasen von Kupferrohstein direkt auf Schwarzkupfer. By Dr. E. Günther. *Metallurgie,* II, 1905, Nov. 22, pp. 539-545.

The Gold Deposits of Plomo, San Luis Park, Colorado. By Charles G. Gunther. *Economic Geology,* I, 2, pp. 143-154. Illustrated. These are found on the west flank of the Sangre de Cristo mountains. The ores occur as impregnations of a highly decomposed granite gneiss.

Ore Horizons in the Veins of the San Juan Mountains, Colorado. By Chester W. Purington. *Economic Geology,* I, 2, pp. 129-133. The vertical veins of this region show marked variations in metallic wealth, apparently dependent upon the variable acidity of the enclosing rock horizons.

The Geology of the Diamond and Carbonado Washings of Bahia, Brazil. By Orville A. Derby, State Geologist of Sao Paulo, Brazil. Translated by J. C. Branner. *Economic Geology,* I, 2, pp. 134-142. Structural geology of the basin of the Rio Paraguassu, which includes the *Chapada Diamantina.* The same author has previously discussed the origin and occurrence of the diamond.

The Simplex System of Concrete Piling. By Constantine Shuman. *Proceedings* of the Engineers' Club of Philadelphia, xxii, 4 (Oct., 1905), pp. 347-371. Illustrated. Consists in driving a cylindrical mold, with pointed hinged bottom, partially filling it with concrete, holding the concrete down while drawing up the mold, and repeating the operation until the hole is filled and the mold withdrawn.

Questions and Answers.

Chrome Ore.

What is the market for chrome ore? I have a large deposit of chromite in an eastern State.

Answer.—The only deposits of chrome ore in the United States now productive are in California, where about 150 tons are mined annually. The consuming centers, however, are in the East, and the demand is suplied by importation, duty free, from New Caledonia, Turkey and Canada; in 1904, 24,228 long tons, worth $348,577, were imported. The rapid development of this industry in New Caldonia has led to a decline in market prices, ore, carrying 50% chrome oxide, now selling for $19@$19.50 per long ton at New York, with a premium of 40c. per ton for each per cent. of oxide above the 50% basis.

The demand for light-grade chrome is growing, its use being the preparation of ferro-chrome for steel making, chromium for the tanning industry, and chrome brick for metallurgical works. Ferro-chrome is made by the Wilson Aluminum Co., of New York, at its plant at Kanawha Falls, W. Va., and at Holcomb Rock, Va., and by the Beaver Metallurgical Co., at Beaver Falls, Pa. The largest manufacturers of chromium salt are the Kalion Chemical Co., of Philadelphia, and the Baltimore Chrome Works, of Baltimore. The Harbison-Walker Refractory Co., of Pittsburg, makes chrome brick. Granulated chrome ore is also used in its natural state as a furnace lining in basic open hearths.

The possibilities of a chromite ore supply in an Eastern State are dependent upon the purity of the ore and the freight charges to a consuming center. Its principal competitor would be the New Caledonia ore, which is of remarkable richness, averaging 56% chromic oxide, without any concentration, which occurs in easily mined masses of great size (20,000 tons have been taken from a single orebody), and which pays a freight of from $3 to $4.25 per ton to the Atlantic ports.

Value of Marl.

What is the value of marl, occurring about four miles from a line of railway, the substance having the following composition: Water, 0.72%; silica, 1.18%; iron and alumina, 0.32%; calcium carbonate, 91.86%; magnesium carbonate, 3.44%; organic matter, 2.48%? The deposit is upward of 16 ft. in thickness.—J. C. W.

Answer.—Such material has no value except as a fertilizer, to which use it is limited to the immediate vicinity. It contans too much magnesium to be adapted to the manufacture of cement.

Abstracts of Official Reports.

White Pass & Yukon Railway Company.

This company owns and operates the White Pass & Yukon railroad, from Skagway to White Horse, with a branch to the Atlin country; also steamboat lines on the Yukon river and Atlin lake. It controls the main line of transportation connecting the Yukon and a large part of Alaska with the coast. Its business is entirely dependent on the mining industry. The local companies are owned by a holding corporation in London, which paid $137,730 dividends last year.

The earnings for the year 1904 were as follows:

	Gross.	Net.
Railroad	$991,665	$466,992
River line	737,895	249,843
Mail service	203,748	51,092
Total	$1,933,308	$767,927
Depreciation and miscellaneous		$169,572
Interest on bonds		256,781
Total charges		$426,353
Surplus for the year		$341,574

The report says: "On the rail division we carried 11,773 passengers and 33,225

tons of revenue freight (against 12,683 and 33,704 respectively in 1903). Everything connected with the railway has been kept in first-class condition. In doing this work, gravel ballast to the extent of 57,826 cu. yd. was distributed and 6,775 new and 550 second-hand sleepers were laid in the main line. Notwithstanding the outlay on this work, the operating expenses of the rail division for 1904 show a decrease of $27,155.

"The company's fleet in 1904 carried 6,849 passengers and 26,066 tons of revenue freight (contrasting with 8,787 and 23,559 respectively in 1903). We operated 13 steamers and 8 barges on the rivers and lakes and held 5 steamers in reserve. The first boat left Hootalinqua for Dawson on May 13; the first through boat left White Horse for Dawson on June 6, and the first boat for Atlin left Caribou Crossing on June 2. The last through boat from Dawson reached White Horse on Oct. 22. The last boat from Atlin reached Caribou Crossing on Nov. 3. The season showed little or no improvement over 1903 so far as the depth of water in the river was concerned, but this was not, as in 1903, because of any shortage of winter snowfall, but because the summer was so cold that the heavy snowfalls never melted. Upwards of $32,000 of unusual expenses were incurred for repairs. A largely increased tonnage was moved, but a net saving was effected in the operating expenses of $67,351, as compared with the previous year.

"The winter stage line service was carried on as usual between White Horse and Dawson, by means of four-horsed sleighs and fourhorsed coaches, which made 158 trips during the year 1904 (equivalent to 52,140 miles), carrying 30 tons of mail, 945 passengers, 10½ tons of parcel freight, including gold dust, and 280 tons of ordinary freight, of which, however, 153½ tons were copper ore from the mines near White Horse, involving only a short haul. The gross receipts for the mail service year were $203,748 and the operating expenses were $152,656, leaving, after allowing for reserve and depreciation, a profit of $51,092, as against $35,290 for the previous year.

"In the Klondike district the gold output was maintained on about the basis of the previous year, but machinery enters increasingly into the production, while the hand mining continues to fall off. Thus fewer miners are employed in producing an equal quantity of gold. The Tanana goldfields attracted great attention in 1904 and seem likely to produce largely. A railway is being constructed connecting them with the towns of Chena and Fairbanks on the Tanana river, the materials going in by our route. In the neighborhood of White Horse, the Alsek goldfields did not produce much in 1904, as the ground could not be profitably worked by hand methods, and individual miners could not affort to instal plants on their claims, the cost of transportation from White Horse being prohibitory. This has now been reduced by the construction of a road by the Canadian government, and a syndicate has acquired substantially all the rights on Bullion creek. Work has continued on the Arctic Chief and Copper King copper properties at White Horse, and on the latter a large orebody of good value has been developed. In the Atlin district hydraulicking was active in 1904 and the gold output was increased. At Tantalus the coal mine referred to in the report of 1903 was developed during 1904 and a wharf and tipples, etc., built. The coal is of good quality and should help to solve the fuel problem at Dawson and elsewhere."

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ended Dec. 5, 1905.

806,103. CONVEYER. — Paul Burchardt, Kramfors, Sweden.

806,104. APPARATUS FOR UTILIZING WATER-POWER.—Walter R. Burkhard, Bliss, Idaho.

806,108. AUTOMATIC PRESSURE-REDUCING VALVE.—Francis L. Clark, Pittsburg, Pa., assignor to the Westinghouse Air Brake Company, Pittsburg, Pa.

806,116. HOISTING-MACHINE.—Lewis W. Delp, Peoria, Ill.

806,121. ZINC-FURNACE.—Emile Dor-Delattre, Budel, Netherlands.

806,127. REDUCTION-FURNACE.—Frederick W. Field, Syracuse, N. Y,

806,128. ROCK-BORING MACHINE.—Heinrich Flottmann, Bochum, Germany.

806,133. CUT-OFF ATTACHMENT FOR METAL-FORMING PRESSES.—David T. Graham, St. Louis, Mo.

806,145. MINING-MILL.—Frederick J. Hoyt, Chicago, Ill.

806,146. PROCESS OF MANUFACTURING PORTLAND CEMENT.—Edward H. Hurry, Bethlehem, and Harry J. Seaman, Catasauqua, Pa.

806,153. PROCESS OF MAKING SPECKLED-ENAMELED WARE AND THE PRODUCT THEREOF.—Walter J. Kohler, Sheboygan, Wis., assignor to J. M. Kohler Son's Company, Sheboygan, Wis.

806,161. MANUFACTURE OF HYDRAULIC CEMENT.—Wilhelm Michaelis, Berlin, Germany, assignor to Fried. Krupp, Grusonwerk at Magdeburg-Buckau, Germany.

806,173. ELECTRIC FURNACE.—Romaine W. Myers, Fruitvale, Cal.

806,179. MOLDING-MACHINE.—William J. Patchell, St. Louis, Mo.

806,194. FUEL.—Mentheim Salomon, Toledo, Ohio, assignor to Edward A. Dewey, Toledo, Ohio.

806,197. BRICK-TONGS.—Fritz Schulz, Chicago, Ill., assignor to the Good Manufacturing Co., Chicago, Ill.

806,199. GAS-ENGINE.—Peter Schwehm, Reisholz, Germany.

806,208. APPARATUS FOR STRIPPING MOLDS FROM INGOTS.—Clarence L. Taylor, Alliance, Ohio, assignor to the Morgan Engineering Company, Alliance, Ohio.

806,234. WATER-PURIFIER.—Peter Bastian, Grevenbroich, Germany, assignor to Maschinenfabrik Grevenbroich, Grevenbroich, Germany.

806,257. INCANDESCENT OIL-LAMP.—Hilary Jacobs, New York, N. Y.

806,288. EXCAVATOR.—Morton E. Pugh, Chicago, Ill.

806,308. GASOLINE-BURNER.—Rollin H. White, Cleveland, Ohio, assignor to the White Sewing Machine Company, Cleveland, Ohio.

806,312. BRICK-MACHINE ATTACHMENT.—James G. Barbour, Canton, Ohio.

806,371. MACHINE FOR MANUFACTURING HOLLOW ARTIFICIAL-STONE BEAMS OR GIRDERS.—Hans Siegwart, Lucerne, Switzerland.

806,393. FUEL-BURNING APPARATUS.—William J. Carlin, Boston, Mass.

806,413. ELECTRODE FOR ELECTROLYZERS USED IN THE MANUFACTURE OF BLEACHING LIQUORS. — Richard Kother, Cunewalde, Germany, assignor of one-half to Charles Edward Waithman Gaddum, Montford, England.

806,414. METAL-SEPARATOR FOR ORE-CONCENTRATING PLANTS.—Henry C. Krause, Point Mills, Mich.

806,422. FURNACE-GRATE.—Joseph J. Merrill, Chicago, Ill.

806,491. FILTER-PRESS.—Richard Pick, Buffalo, N. Y.

806,511. EXCAVATOR.—William H. Arnold, Brooklyn, N. Y.

806,530. SAND-DRIER.—Clark J. Duncan, Windber, Pa.

806,564. SMOKELESS POWDER.—Ralph D. Peck, Danville, Wis.

806,585. CARBIDE-HOLDER.—Edwin M. Sherman, Chicago, Ill., assignor to Acetylene Apparatus Manufacturing Company, Chicago, Ill.

806,591. COMPOSITION FOR PRESERVING PILES AND TIMBER.—Peter S. Smout, Everett, Wash., assignor of one-half to John A. McGhie and Norval McGhie, Everett, Wash.

806,619. FEED-WATER REGULATOR FOR BOILERS.—Jesse T. Avary and Edgar L. Thomas, Ada, Ind. Ter.

806,621. COPPER-REFINING FURNACE.—Ralph Baggaley, Pittsburg, Pa.

806,628. HEATING-FURNACE.—William N. Best, Los Angeles, Cal., assignor to John H. Best and Ezra Best, Quincy, Ill.

806,634. SYSTEM OF STORING AND DELIVERING LIQUID FUEL.—Clifford J. Campbell and Thomas F. Hall, New York, N. Y.

806,641. PULP-SCREEN.—Frank M. Chapman, Fort Edward, N. Y., assignor of three-fourths to William J. Gallagher, Sandyhill, N. Y.

806,640. PULP-SCREEN.—Frank M. Chapman, Fort Edward, N. Y., assignor of one-third to William J. Gallagher, Sandyhill, N. Y.

806,643. SCREW CONVEYER.—George L. Chatfield, Indianapolis, Ind.

806,690. ELECTRICAL RING-FURNACE.—Karl Meiser, Nuremberg, Germany.

806,700. LINK FOR CONVEYERS.—Jacob B. McKennan and Axel H. Helander, Pueblo, Colo.

806,732. SYSTEM FOR CONVEYING DISTRIBUTING, AND EXCAVATING MATERIAL.—Hiram W. Blaisdell, Los Angeles, Cal.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week ended Nov. 25, 1905.

25,344 of 1904. TIPPLE.—W. Galloway, Cardiff. An automatic apparatus for stopping, weighing, and re-starting mine cars and other wagons.

25,882 of 1904. BRONZE ALLOY.—A. Jacobsen, Hamburg. A bronze of great tensile strength and hardness, composed of 49% copper, 40% of zinc, 5% of ferromanganese, and 6% of a copper-iron-nickel-aluminum alloy.

26,795 of 1904. TELESCOPIC PROP.—E. Morhenn, Homberg, Germany. An improved telescopic pit prop, that will not telescope directly the pressure exceeds a certain amount.

27,408 of 1904. APPARATUS FOR REMOVING MOISTURE.—E. Hesketh and H. Brier, London. Improved refrigerating apparatus for removing moisture from air used in the blast of blast-furnaces, converters, etc.

28,041 of 1904. DETONATOR.—R. H. F. Rennick, India. A detonator for firing mining cartridges, composed solely of gunpowder, and ignited electrically.

28,128 of 1904. PURIFICATION OF SOLUTIONS.—H. Hirtz, London. Removing iron from solutions of nickel or cobalt salts, by adding hydrated peroxide of nickel or cobalt.

3,032 of 1905. ANNEALING COPPER.—E. A. Claremont, Manchester. Annealing copper by immersing it in water and passing a current of electricity through it to raise it to the necessary temperature, and afterward letting it cool in the same bath of water.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Foster Hewett, of Pittsburg, is in Peru, South America.

Mr. W. A. Moyer is appointed industrial agent of the Delaware & Hudson Co., with office at Albany, N. Y.

Mr. G. C. Hewett, of Colorado Springs, has spent several weeks in Goldfield, Nev., and is now visiting Utah on professional business.

Mr. Arthur Houle has been appointed superintendent of the Calumet & Arizona smelter, at Bisbee, Ariz., in place of James Wood, resigned.

Professor James F. Kemp has returned to New York, after examining some iron-ore properties in the southern part of the Adirondack region.

Mr. Franklin H. Griffith, general manager of the Lehigh & Arizona Mining Co., left Chloride, Ariz., recently on a business trip to Los Angeles.

Mr. J. W. Mercer, of Denver, sailed from New York, Dec. 9, on his way to Ecuador, where he expects to remain several months on professional business.

Mr. J. P. Wallace, general manager of the Monmouth Mining & Development Co., of Kingman, Ariz., has gone East to arrange for the purchase of machinery.

Mr. Charles Cadmus, of Washington, has taken the management of the Appalachian Conduit Co., and the Virginia Exploration Co., at Broad Run, Virginia.

Mr. F. J. H. Merrill, consulting geologist of New York, recently returned from a trip to Canada. He leaves this week for Idaho on professional business.

Mr. Olaf Bergstrom has gone to the smelter of the United Verde Copper Co., at Jerome, Ariz., as consulting metallurgist. He was recently at Butte, Montana.

Mr. J. W. Astley, until recently general superintendent of the Le Roi Mining Co., left Rossland, British Columbia, on Nov. 28, for England, going by way of New York.

Mr. Marshall D. Draper, late of Denver, Colo., is now superintendent of the Lehigh & Arizona Mining Co., at Chloride, Ariz. He has had charge of mines in Colorado and Nevada.

Mr. C. E. Lentz, president of the Lentz Gold & Copper Co., operating in Madison county, Montana, who is managing the affairs of the company, is spending a few days in Pittsburg.

Mr. Louis A. Wright, mining engineer of San Antonio, Texas, has returned to the United States from Sonora, Mexico, where he has been for two months on professional business.

Mr. E. J. McCaustland, assistant professor of mining at Cornell University, Ithaca, N. Y., has made arrangements to devote part of his time to general practice as consulting mining engineer.

Mr. H. J. Beemer, of New York, has been visiting the Storm Cloud and other properties in Yavapai county, Ariz. He was accompanied by W. R. Russell and J. B. Giraud, mining engineers.

Mr. William Singleton has returned to New York from a stay of several years in Southern Brazil, where he has been erecting and managing an extensive cyanide plant for the Empreza Aurifera de Apiahy, owned by capitalists of the city of Sao Paolo.

Mr. W. H. Aldridge, chief of the Canadian Pacific Railway Co.'s mining and metallurgical department, and Mr. John H. Mackenzie, general manager of the Le Roi Mining Co., have gone to England. The latter went at the request of the board of directors of the Le Roi Company.

Mr. H. W. Althouse, mining engineer of Pottsville, Pa., has just completed an examination of the Big Sandy coal basin in Russell, Buchanan and Dickinson counties in Virginia, and Pike county in Kentucky. The region inspected covers about 30 by 13 miles—400 square miles, and has six seams of coal.

Professor Theodore Whittlesey, for some years connected with the department of chemistry, Cornell University, and more recently adjunct-professor of chemistry in the School of Pharmacy of Northwestern University, has recently been appointed adjunct-professor of chemistry in Northwestern University.

Mr. Jas. H. Henley, late superintendent of the Granite Mountain mine, Phillipsburg, Mont., has been appointed superintendent of the Britannia Copper Syndicate's Britannia mine, on Britannia mountain, Howe sound, British Columbia. Mr. Henley assumed his new duties about the middle of November.

Obituary.

Dr. Gustave Dewalque, formerly professor of geology at Liège, died at Liège on Nov. 3, in his eightieth year.

The deaths are announced of Dr. W. P. Amalizki, professor of geology and paleontology at Warsaw, and of Professor Bernhard Fischer, director of the chemical research laboratory at Breslau.

August D. Fisher, superintendent of the Ideal Mining Co., was killed and Arnold Spencer, of Indianapolis, was injured by a blast at the company's mine, Deadwood, S. D., on Nov. 22. It appears that two shots were lighted and one exploded another. Supposing that one missed fire, Fisher went into the shaft to give warning to Spencer, when both were struck by a large boulder.

The death is announced of O. L. Fernald, manager of the Cumberland mine, Norseman, West Australia. The deceased, who succumbed to an attack of brain fever following on influenza, was well known in West Australia mining circles, and was esteemed by those who knew him. He at one time practiced as a consulting mining engineer in Kalgoorlie, and some months ago, at the instance of the directors of the Victory United Mining Co., made an exhaustive investigation of the Victory United mine. His appointment as manager of the Cumberland only dates a few months back.

August R. Meyer, one of the most eminent metallurgists in the United States died at his home in Kansas City, on Dec. 1. Mr. Meyer was a prominent figure in the silver-lead industry of the United States, almost from its inception. Recently he had been prominently identified with the zinc-smelting industry. He received his technical training at Freiberg, Saxony. Soon after the discovery of the ore deposits at Leadville, Colo., he went to that place, where he engaged in the ore-buying business. Later he became extensively interested in silver-lead smelting, first in connection with the Harrison Reduction Works, and afterward with the Arkansas Valley Smelting Co., in which he became eventually the chief stockholder. Upon the absorption of the Arkansas Valley Smelting Co. by the Consolidated Kansas City Smelting & Refining Co., Mr. Meyer went to Kansas City to reside. After the organization of the American Smelting & Refining Co., into which the Consolidated Kansas City Smelting & Refining Co. entered, Mr. Meyer became a director and a member of the operating committee of the Trust. He ceased to be prominent in the latter, however, when its management was taken over by the Guggenheims, and devoted his attention chiefly to his other interests. About 1901 he organized the Southwestern Chemical Co., which engaged in the manufacture of sulphuric acid and other chemicals at Kansas City. This company was subsequently consolidated with the Standard Acid Co., smelting zinc ore and manufacturing sulphuric acid at Iola, Kan., the new company being called the United Zinc and Chemical Co., of which Mr. Meyer became the president, a position occupied by him at the time of his death. Mr. Meyer was not only an expert metallurgist, but was also an extremely able man of business, and accumulated a large fortune from his various metallurgical interests. His professional ability received high recognition among his contemporaries. His labors were, however, chiefly centered on his own extensive interests, and he was seldom a contributor

to the transactions of the engineering societies; although in his early years he prepared one or more valuable papers which appeared in "The Mineral Resources West of the Rocky Mountains," commonly known as Raymond's reports.

Societies and Technical Schools.

American Chemical Society.—Section C of the American Association for the Advancement of Science will meet in New Orleans on Dec. 29; and, together with the sessions of the American Chemical Society, the meeting will continue to Jan. 2. Headquarters will be at the St. Charles Hotel. The following persons have consented to preside over the sections and to aid in the preparations for the meeting: Physical Chemistry, Louis Kahlenberg; Inorganic Chemistry, William E. Dudley; Organic Chemistry, Charles F. Mabery; Agricultural and Sanitary Chemistry, Harvey W. Wiley; Industrial Chemistry, Samuel W. Parr. Persons desiring to present papers are requested to send titles and brief abstracts to Secretary W. A. Noyes of the American Chemical Society, or to Charles L. Parsons, New Hampshire College, Durham, N. H. Papers should be sent in before Dec. 5 next.

Montana Society of Engineers.—At the regular meeting for November, the report of the Committee on Nominations of Officers for next year was read and approved, and the secretary was instructed to prepare the ballots to be mailed to the members in December. The candidates named are as follows: President, Bertram H. Dunshee, of Butte; first vice-president, Edward C. Kinney, of Bozeman; second vice-president, Archer E. Wheeler, of Great Falls; secretary and librarian, Clinton H. Moore, of Butte; treasurer and member of the board of managers of the Association of Engineering Societies, Samuel Barker, Jr., of Butte; trustee, Geo. W. Wilson, of Butte. The chair named the following committee to recommend a place for holding the annual meeting: Messrs. King, Goodale and Bowman. The committee will report at the December meeting. The Committee on Mining Laws reported progress. The trustees recommended the publication in the Association Journal of President Moulthrop's annual address and the papers of Chas. W. Goodale and Messrs. Carroll and Starz, and the secretary was instructed to forward the manuscripts for publication.

State University of Washington.—The School of Mines, of the State University of Washington, gives a course each winter for prospectors and mining men in general. It is the aim of the institution to make this course thoroughly practical. To that end, the instruction is principally by laboratory methods and visits to smelters and mines in operation. The course begins Jan. 9 and last three months. The expenses of this mining course are limited to the cost of text-books, fees in the laboratory courses and deposits to cover materials used. At the end of the course, the deposit is returned to each student after deducting for supplies used by him. Admission to classes is without examination. The library, dormitory, gymnasium and other accessories of the university, as well as the general lecture courses, are open to the special mining students. The subjects treated in this special course are:

1. Mineralogy. Instruction and practice in blow-pipe analysis, followed by lectures upon the common minerals, with practice in the identification of minerals by field tests.

2. Fire Assaying. Lectures on sampling, preparing ores for assay, furnaces, fuels and reagents. Practice in assaying lead, silver and gold ores.

3. General Chemistry and Qualitative Analysis. Laboratory practice in the determination of the common elements.

4. Geology. Lectures on the elements of geology, the common varieties of rocks, metalliferous veins and ore deposits, etc.

5. Mining, Milling and Smelting. Lectures on systems of mining, transportation, milling machinery and treatment of ores at smelter. Practical work in stamp-mill, concentrating plant and drafting room; visits to mines, mills and smelters.

6. Mining Law. Lectures by a prominent mining lawyer on the mining laws of the United States, British Columbia and Alaska.

The university has a complete crushing and ore-testing plant, laboratory and other conveniences. Its location at Seattle gives opportunities to visit the Tacoma smelter, several large coal mines and other mining districts.

Trade Catalogues.

A new catalogue of clutch pulleys is issued by the Eastern Machinery Co., New Haven, Conn.

The G. W. Price Pump Co., San Francisco, Cal., sends us its new catalogue of centrifugal pumps.

A new catalogue of steam vacuum and other gauges is issued by the Standard Gauge Mfg. Co., Syracuse, N. Y.

The new pocket catalogue of Artists' Materials and Draftsmen's Supplies, published by F. Weber & Co., Philadelphia, is out.

Elevating machinery and elevators are described in the circulars sent out by the Eastern Machinery Co., of New Haven, Conn.

The applications of "Leviathan" belting are pictured in the new catalogue called "Facts" of the Main Belting Co., Philadelphia.

The Eastern Granite Roofing Co., 2 Hudson street, New York, publishes attractive flyers on the subject of its products.

Fuerst Bros. & Co., 2 and 4 Stone street, New York, are sending out a list of products in which they deal. These cover a wide range.

I. B. Williams & Sons, Dover, New Hampshire, issue a series of small pocket catalogues on belting. The notes in some of them are valuable.

The Hunt automatic railway is described in the catalogue of that name issued by the C. W. Hunt Co., West New Brighton, N. Y.

Earle C. Bacon, 26 Cortlandt street, New York, publishes two catalogues, descriptive of ore and rock-crushing machinery and hoisting engines, respectively.

The William Cramp & Sons Ship and Engine Building Co., Philadelphia, Pa., issues a series of flyers describing small castings and alloys made by it.

"Jupiter" transmission rope is described in bulletin No. 6 of the Durable Wire Rope Co., Boston, Mass. The company also issues a series of flyers on the same subject.

The Electro-Dynamic Co., Bayonne, N. J., issues a series of circulars and bulletins describing its motors and generators and applications of motors to machine driving.

The new catalogue of the Harbison-Walker Co., Pittsburg, Pa., is a handsomely bound pocket-book, giving sizes and properties of various refractories manufactured by it.

Cochrane Separators and Heaters, and the Sorge-Cochrane system of water purification and heating are described in three catalogues issued by the Harris Safety Boiler Works, Philadelphia.

The General Pneumatic Tool Co., Montour Falls, N. Y., are successors to the machinery department of the Havana Bridge Works. The company issues a series of illustrated booklets on the subject of pneumatic tools in general, and hoists and riveters in particular.

Industrial.

Pioneer furnace, of the Cleveland-Cliffs Iron Co., at Gladstone, Mich., was blown in on Oct. 12, 1905, after having been idle since April, 1904. The furnace has an annual capacity of 45,000 tons of charcoal pig iron.

The American Acid & Alkali Co., recently organized is now constructing a large plant, on the Erie tracks at Bradford, Pa., for the manufacture of oxalic acid. The Erie railroad issues a list of other industrial plants located along its lines.

Dover Forge & Iron Co., of Canal Dover, Ohio, is producing interesting results in the revival of the knobbled char-

coal iron industry. During October this company produced 510 tons of blooms. All the material was manufactured into boiler tubes for locomotives.

The Nova Scotia Steel & Coal Co., of New Glasgow, N. S., has bought over 10 sq. kilometers (2,471 acres) of coal land, lying under the bed of the ocean to the north of Belle Isle. The company's mines for a long time have been extending in this direction, and have attained a sufficient depth below water to be perfectly safe. It is estimated that over 100,000,000 tons will be recovered from this submarine area.

The Pennsylvania Swedish Iron Co., recently organized in Pittsburg, is building a plant at Cheswick, Allegheny county, Pa., for the manufacture of charcoal iron blooms and skelp for tin-plates, stay-bolts, and boiler tubes. Edward W. Wright is president; Ambrose Beard, of the Dover Forge & Iron Co., vice-president, and A. M. Bell, of the Fayette Coal Co., secretary and treasurer. The company will have shipping facilities over two railroads.

The Cananea Consolidated Copper Co. has just installed a mile of 8-in. bored fir pipe for conveying water to its concentrator at Cananea, Sonora, Mexico. This pipe was made by the National Wood Pipe Co., Olympia, Wash. It is bored out of a solid log in 8-ft. lengths, the bark and sap being turned off from the outside. This is then banded with 1-in. flat steel, spaced according to the pressure for which the pipe is to be used; the entire outer surface is then covered with a preservative coating of tar and sawdust.

The September record of two Isabella furnaces, at Etna, Pa., one of which is operating on the Gayley dry air blast, and the other on ordinary blast, is interesting. No. 1 furnace, with the Gayley refrigerating plant, made a ton of iron with 1,939 lb. of coke, while No. 3, using ordinary blast, required 2,339 lb., a lowering of the coke consumption in favor of the Gayley dry air blast of 400 lb. per ton of iron. No. 1 furnace made 413 tons of iron per day, as compared with 362 tons for No. 3, a gain of 51 tons per day. It should be noted that No. 1 was running on bessemer pig iron and No. 3 on basic, the former carrying 0.5% of silicon more, so that the iron made in No. 1 should really have used more fuel.

The Alabama Steel & Wire Co., of Gadsden, Ala., and the Underwood Coal & Iron Co., of Blount county, have been merged into the Southern Steel Co., recently incorporated, with a capital of $16,000,000. Everett T. Schuler and George H. Schuler, vice-president and treasurer of the new company, were formerly in the American Steel & Wire Co. and have been for more than a year identified with the development of the Alabama plants. Robert B. Van Cortlandt, of the banking house of Kean, Van Cortlandt & Co., which financed the merger, and Moses Taylor represent the New York interests in the directorate of the new company. The other directors are Harrison B. Schuler, John Bindley, and C. Van Camp.

Construction News.

Tonopah, Nevada.—The Montana-Tonopah Gold Mining Co. is carrying out extensive improvements on its surface plant.

Perris, Riverside County, California.—The Arlington Mining Co. is to erect a 10-stamp mill and two oil-burning boilers. Address at this place.

El Dorado, California.—The 40-stamp mill at the Union mine has been destroyed by fire. A. Harpending, owner, announces that he will rebuild at once.

Willow Valley, California.—The Deadwood mine has been leased to J. N. Esslestyn, of San Francisco, who will erect a hoist and pumping plant.

Chloride, Arizona.—On the Pinkham & Midnight Group it is proposed to put in a matte smelter. G. H. Hopper and R. G. Eckers, Los Angeles, Cal., are lessees.

Harrisburg, Pennsylvania.—The Pennsylvania Railroad Co. is about to erect a coal wharf in Harrisburg. It will be equipped with the latest coal-handling appliances.

Thunder Mountain, Idaho.—The Sunnyside Mining Co., owner of the Sunnyside mine, Thunder Mountain, has decided to build a new cyanide plant. Capt. Treweck, Thunder Mountain, Idaho, is superintendent.

Saltese, Montana.—There is talk of building a smelter at Saltese, Mont. Missoula people are behind the project, and think the field more favorable now that the Monitor copper mine is again on a shipping basis and able to supply a large tonnage as soon as the shaft and works generally are in condition for uninterrupted extraction.

Dubuque, Iowa.—The Dubuque Ore Development Co. has been formed in Iowa, with a capital of $12,000, to prospect for zinc ore in the Dubuque district. Preliminary operations will be carried on by means of deep drilling machines. Robert Bonson, Dubuque, is president of the company. Catalogues of drilling machines and supplies are solicited.

Prairie View, Arkansas.—A company is being formed in New York to develop collieries in Arkansas on an extensive scale. H. L. Remmel, chairman of the Republican State Committee of Arkansas, is at the head of the movement. The mines are situated near Prairie View, south of the Arkansas river. They are opened up, but require a full surface equipment.

Special Correspondence.

San Francisco. Dec. 6.

The Kennedy Mining Co., at Jackson, Amador county, has sold to the Selby Smelting Co. a pile of waste from the chlorination works, comprising many thousand tons. Many attempts have been made to extract the gold from the sulphurets on the ground, but they were failures, and it would not pay to haul the material by team to the railroad, a distance of 12 miles. The new railroad from Ione has, however, solved the transportation question.

Although a great deal of rain has fallen during the past week, there has not yet been enough to fill all the streams and ditches, as the soil has absorbed most of the water. Some few stamps along the Mother Lode region have been set dropping, but it will be some time before there is a plentiful supply of water for power. The hydraulic mines throughout the State are ready for work, but there is not yet water enough for them to do very much. In Nevada county some of the mines which have been using electricity for power have been given permission to start up their mills. The water question there is still, however, a matter of serious consideration, and most of the mills are still idle, and will be until more rain falls and the reservoirs begin to fill, so that the ditch systems become available.

George W. Rumble, of the Sunset Mining Co., owning the old Glory mine, in Butte county, in this State, has at last had judgment pronounced against him in a civil suit. On top of his conviction in the Federal court on a charge of using the mails to defraud through the sale of stock of the company named, Judge Graham has rendered a decision that every cent of the $230,000 Rumble secured through the sale of stock was fraudulently obtained, and judgment for this amount has been recorded against the promoter and in favor of Dix W. Smith, representing the defrauded stockholders. Rumble has been telling all sorts of stories of persecution by secret-service men, the State mineralogist and others; but the result of the litigation has shown that these men were right in bringing him to the bar of justice. He has played the game successfully many years and made much money, but has been brought up with a round turn.

Up at Harrison gulch, Shasta county, where there are many mines, including the productive Midas property, there has been much litigation between the townsite and mineral claimants. A telegram from Washington now says that the Secretary of the Interior has dismissed the protest made by the townsite people against the issuance of a mineral patent. This is looked upon as a great victory for the mineral claimants and a defeat for the townsite claimants. There have been about a dozen decisions in this case, the victories being about evenly divided. The

townsite people are still in possession of the town. The Sherks, however, now expect to receive their patent, as the protest was the only obstruction.

An extensive oil deal has just been concluded, the Pacific Oil Transportation Co. having sold all its holdings to the Associated Oil Co., the purchase price being understood to be $3,500,000. The property which is included in the deal takes in the Coalinga pipe-line, 130 miles in length, from Coalinga, Fresno county, to Monterey; 50 miles of pipe-line from Garviota to Santa Maria; the refinery and wharf there; 3,000 acres of land; wharves and tanks at Monterey, and tanks and stations at Portland, Tacoma, Alaska, Honolulu, in Humboldt and San Francisco. The deal also includes the National Oil Transportation Co., the Pacific Oil Transportation Co., the Coalinga Transportation Co., and four tank steamers.

There is known to exist in the head of Bull creek, in the eastern part of Butte county, on the lands of the Diamond Match Co., an extensive deposit of iron ore. In the course of the exploitation of these great timber fields, the Butte County railroad will tap that section. It is expected that when this road is completed the iron ore will be mined, and there are already rumors of a proposed furnace at Chico. None of the iron-ore deposits of California are now being utilized, the main difficulty being lack of proper fuel for smelting.

Salt Lake City. Dec. 8.

The announcement has been made that plans are well under way for the building of a large smelting plant in the vicinity of Bonneville, 12 miles north of Ogden. Just who is behind the enterprise has not been ascertained, yet the information comes from a reliable source that the plant will be built and that a feature of the enterprise is that it is proposed to put in equipment to handle zinc ores, of which the mines of Utah can produce a large tonnage. Agents of the syndicate have been quietly obtaining options on ground, together with water-rights, for several weeks past. The building of the plant will stimulate mining in northern Utah, particularly in the Sierra Madre district in Box Elder county.

The construction of the new Western Pacific is going ahead steadily. About 80 miles have been graded west of Garfield, the new smelter town on the south shores of the Great Salt lake. In the Deep Creek mining district there is more activity than at any previous time.

The mills of Bingham have been greatly embarrassed during the past week on account of the breaking down of the motive power of the Copper Belt railroad, upon which several of the big properties depend to get down their ore. The plants of the Ohio and the Utah copper companies were forced to close, while the Boston Consolidated, the Bingham-New Haven, the Yampa and the Bingham Consolidated mines have been forced to curtail their output if not to close down entirely.

The coke famine, which threatened to close the Utah smelters, has been passed over successfully and no more trouble is anticipated. The Pleasant Valley Coal Co. has its product about up to normal again.

Denver. Dec. 8.

Besides the regular dividend of 1c., the Findley Consolidated Mining Co. will pay an extra dividend of the same amount this month. The Acacia Gold Mining Co. has filed a complaint in the District Court, claiming that the Findley has taken $10,000 worth of ore from ground belonging to the former company.

Through his attorneys, James F. Burns has filed a petition in the district court, requesting the appointment of a commissioner to properly conduct the meeting of the stockholders of the Colorado Springs & Cripple District railway, to be held on Dec. 20.

The Dillon Gold Mining Co. has just paid another 1c. dividend, making a total disbursement of nearly $32,000 for that purpose during the year. Their main source of revenue is from the Price & Waters lease. These lessees have lately been shipping a large amount of ore, averaging about 3 oz. gold per ton.

To satisfy a judgment of more than $17,000, obtained in Denver by Jacob Wallace, the sheriff of Teller county has sold the property of the Cripple Creek Tunnel, Transportation & Mining Co., on Beacon Hill.

The news of the demise of August R. Meyer, at Kansas City, was received in Denver with much regret.

Judge Owers, in the District Court of Leadville, has rendered a decision, making permanent the injunction restraining the Iron-Silver Mining Co. from forcing its men to take out cards issued by the Mine-Owners' Association. This is a victory for the Western Federation of Miners. The case will be appealed to the Supreme Court.

The report that a consolidation had taken place of the Tomboy properties at Telluride and the Treasury tunnel mines cannot yet be confirmed.

In the Florence oilfield, where the United Oil Co. struck a flow of 75 bbl. per day in one of its wells, the output has increased to about 100 bbl., a rare occurrence.

It is stated that after having been idle for several years, there is a probability of the Rocky Mountain smelting plant, near Florence, being started again. Several of the parties interested in the same have been in Colorado during the past few days.

An interesting case is on trial in the District Court at Denver, involving a large amount of stock in the Wilfley Ore Concentrator Syndicate, Ltd., of London, valued at about $250,000, including accrued dividends.

Leadville. Dec. 9.

According to the inclemency of the weather during the month of November there was a slight falling off in the tonnage; a number of the outlying mines had to stack the ore waiting for the roads to open. The weather is again settled and the roads are all packed down solid, so that this month will see a large increase in the tonnage. The total for November was 78,000 tons of all classes of ore; the zinc shipments amounted to 15,000 tons.

From the amount of ore that is in sight and the large area of undeveloped territory still to be opened, the American Smelting & Refining Co. shows its faith in the future of the camp by enlarging the Arkansas Valley plant at this point by putting in two new furnaces, which will give 11 blast-furnaces in operation. It is stated on good authority that the Eilers plant at Pueblo will be enlarged and improved; the Philadelphia will not be put into commission, as it would cost too much to bring the plant up to modern requirements. With the enlarging the Eilers plant this means increased tonnage from Leadville, as the bulk of the fluxing ores comes from this section.

An order was received recently from the Illinois Steel Co. to ship 5,000 tons of manganese ore as soon as possible. This order is now being filled.

From the Moyer shaft of the Iron Silver Mining Co. during the month of November 13,000 tons of ore were shipped, one of the heaviest months of the year. Of this 10,500 tons were zinc; 1,500 tons iron sulphides, 500 tons copper and 500 tons lead carbonates. Good progress is being made in sinking the Tuscon shaft, an extension of the Moyer, and by the end of January the orebody should be reached. The diamond drill went through 185 ft. of ore.

A fair body of ore has been opened in the Enterprise shaft, Breece hill; the character of the ore is silicious running fairly well in gold. A new plant of machinery will be installed this week, and the ore-shoot thoroughly opened.

Butte. Dec. 5.

United Copper has struck a 4-ft. vein of high-grade copper-silver ore in the east workings of its Lexington mine above the water level. The extent of the body is not yet known, as no drifting has been done. In addition it has two other veins in the property, one of which carries copper and silver, and the other copper and zinc, with a by-product of gold and lead. This mine and the Cora, also a United Copper claim, were practically out of business last week, on account of an accident to the motor of the air-compressor at the Cora. Both mines receive air from the

same source. The damage has been repaired and the extraction of ore resumed. The company is still searching for a payshoot in the Belmont. In driving a crosscut north on the 800 level it encountered abandoned workings 600 ft. from the shaft. It is raising on a vein of low-grade ore, in bunches, midway of the old workings and shaft.

Neversweat, one of the Amalgamated mines, is temporarily disabled by a squeeze in the shaft, but will be in operation within a week. Some ore is being mined in it and raised through the Parrot and Anaconda shafts.

North Butte finished re-timbering its shaft today and will begin hoisting ore through it tomorrow. The job consumed three and a half months. The daily output of the property, while the work was in progress, was between 500 and 600 tons, which was raised through the shaft on the High Ore. The output will now be increased. The new engine, which was to have been delivered Dec. 1, will not arrive for several days, and the head-frame will not be delivered until about Feb. 1. In the meantime the old engine and gallows frame will be used.

East Butte Copper announces that it will be in shape for active work within a week. James W. Neill, consulting engineer for the Pittsburg, has finished his examination of the mines comprising the group. Nearly all of this company's claims are yielding a good grade of copper-silver ore.

Pittsburg & Montana Copper is operating steadily in its mines and smelter. Two shipments of copper were made last week, and another is billed for tomorrow. The veins are improving with the progress of the drifts toward the west. The new shaft, which is to be sunk 1,200 ft., is now down 35 ft., and the work is being prosecuted as rapidly as possible. It is only 50 ft. to bedrock at the point where the sinking is being done. It is 650 ft. where No. 2 is sunk.

Amalgamated's output of ore this year will exceed that of last year by 307,000 tons, the total being 3,507,000 tons, against 3,200,000 tons during 1904. It is turning out 14,000,000 lb. of copper per month at its Washoe plant, and 8,000,000 lb. at Great Falls. Its output of copper for the year will be about 264,000,000 lb. The total silver production will be 9,000,000 oz., and the total gold 60,000 oz. This includes the yield of purchased ores.

The output of the Original or Clark properties will aggregate 18,000,000 lb. of copper, 1,100,000 oz. silver, and 1,600 oz. gold from 350,000 tons of ore.

Calumet, Mich. Dec. 9.

In spite of inclement weather, which handicapped the railroads and curtailed rock shipments last month, Lake Superior copper mines came near establishing a new high-record output in November. The production last month was approximately 19,350,000 lb. of refined copper. Barring unforeseen accidents, this month's output should be the largest in the history of the district. Not only will the mines endeavor to take advantage of the present scarcity of the metal and resultant high prices, but every effort will be made to turn out as much copper as possible for the last boats to leave Lake Superior for lower lake ports.

Present indications are that navigation at copper country ports will cease next week. The smelters in this district are located on Portage and Torch lakes, which are arms of Lake Superior, and ice stops navigation earlier than in other sections.

Nearly every mine in the district suffered from the storm last week, which was of unusual severity for the period of the season. The Mohawk and Wolverine stamp-mills lost 36 hours each. The Centennial and Allouez each lost a few days, and probably all the other producers lost at least a day.

Preparations are being made for additional power facilities at the St. Mary's Mineral Land Co.'s Challenge mine, in the South Range district. Parts of a Parker steam generator are on the ground and the boiler will be installed as soon as possible. Development work continues, the lode showing a healthy appearance, and occasionally a nest of copper is run into as drifting upon the lode advances.

Judging from present indications, it is likely to be six months before No. 2 shaft of the Baltic mine will be in shape for production. The permanent hoisting engine is installed and the foundation of the shaft and rock house is practically finished. The structure will be built of steel, and the superstructure will be started as soon as the foundation is in readiness. In the meantime underground developments are being carried forward with the temporary hoisting plant and through connecting workings of No. 3 shaft.

One of the most important developments of late years by the Franklin Mining Co. is the recent strike of high-grade copper ground in the Junior branch of the property. At the twentieth level of No. 1 shaft the openings are in the richest shoot of copper ever opened on the Allouez conglomerate lode. While the recent openings are the richest ever made by the Franklin Co. on its Junior property, there has been a gradual improvement in the character of the lode at that branch of the mine as depth was gained. This improvement has been more notable below the nineteenth level, until at an additional depth of 100 ft. the richest ground was penetrated. No. 1 shaft is being sunk to the twenty-first level now and the same high-grade copper rock is being opened. That the rich zone is not a small shoot is proved by the work accomplished on the twentieth level. Drifts have been extended 40 ft. each north and south from the shaft, the rich ground continuing in the breast of both drifts. Thus it will be seen that 80 ft. of the high-grade territory is certain, with every indication that it continues on both sides of No. 1 shaft.

At the Rhode Island property the work of locating the Kearsarge lode is now fairly well advanced. While the lode has not been encountered, it is expected that it will be found with little difficulty, the results recently secured by the Franklin Co. forming an excellent basis for the operations. The sand-pipe through which the diamond drill will operate has not yet reached the ledge of solid rock. The site of the drill work is in the extreme southeast corner of the property.

At a meeting of the stockholders of the Resolute Copper Co., held in Calumet recently, the board of directors was authorized to sell the property. Another matter that was to have been acted on was the increase of the capitalization, but this went by default because of the authorization of the sale of the property. The Resolute has 930 shares outstanding of a par value of $25 each. It owns 1,120 acres of mineral land in Keweenaw county, exceptionally well situated, and it is understood that the Calumet & Hecla Mining Co., the Keweenaw Copper Co. and certain officials of the Calumet & Arizona Mining Co. are among the probable purchasers. The Resolute carries the underlay of the Montreal River lode beneath part of its property. This bed has shown exceptional promise on the Calumet & Hecla's Delaware mine. The Resolute also carries the Kearsarge lode.

Duluth. Dec. 8.

Total shipments over the Duluth, Missabe & Northern road for the season have been 8,804,443 gross tons, and over the Duluth & Iron Mountain Range 7,786,600 tons. The third road, the Great Northern, still has a little ore in dock, which will be gotten out in a few days. Shipments from other ranges are in progress in a small way, and the exact figures are impossible to secure. The Crystal Falls district is through for the year, as are most of the Gogebic, Marquette and Menominee ranges, but there are a few mines whose ore is still on the way forward. The Michipicoten district, the only ore-producing district yet opened on the Canadian side of Lake Superior, has closed the year with shipments of 169,527 gross tons, making the mine, to date, show a product of 1,007,000 tons. It is liable to produce steadily all winter and to make a larger output in 1906 than this year. It is now stock-piling. There were very few Lake mining men in the early days of this mine who believed it possible that more than 500,000 tons could ever come out of it.

Considerable important development is under way on the west end of the Gogebic range, where several shafts are going

down to about 2,000 ft. Among those heavily interested are the Hayes Bros., fee owners of the Ashland mine, and the Cleveland Cliffs Iron Co. The former have the old Germania, now the Harmony, and they are sinking a shaft that is now down 1,400 ft. They have reached excellent ore, but are going on to the intended depth. The old Iron Belt, now under development for the Cleveland Cliffs Co., is reaching for great depth and 65 men are engaged in shaft sinking. It has been previously developed to 900 ft. At the Atlantic, also on the west end of the range, No. 2 and 3 shafts are being deepened. The former had been developed to the fifth level, 950 ft. Other old workings are being developed at greater depth, and the future of the Wisconsin end of the range is very bright. East of the Norrie group the Oliver Co. is sinking a deep shaft in the foot-wall at the old Davis, to reach ore found on its lands north and at great depths. This will be a large and well-equipped steel shaft, on the plan of the Oliver Co.'s new works.

The Penn Iron Mining Co., operating mines on the Menominee range, has contracted with the General Electric Co., through its Duluth office, for a complete hydro-electric plant for operating its mines. The first contract is for apparatus that will furnish 2,000 h. p., to be followed later by an additional capacity of 2,000 h. p. more. The current used will be for the purpose of operating hoists, compressors, and pumps at East Vulcan, West Vulcan and Curry mines, properties which this year have produced about 450,000 tons, and are developed to the depth of about 1,200 ft.; they have been explored 300 ft. deeper and may soon be mined to that depth. The motors will include one 450 h. p., four 300 h. p., three 200 h. p., and a number of smaller sizes, ranging down from 75 to 15 h. p. Pumping will be taken care of by two centrifugal pumping sets of capacity for 1,800 gal. per min.; the pumps are to be six-stage and will be directly connected to 550-h. p. motors each. A good many new features have been worked out in this pumping plant, as well as in the other portions of the installation, which can be better described later. The dam, at which electricity is to be generated, is six miles from the more distant mines, and the transmission lines will be erected for the total capacity of 4,000 h. p. at 13,200 volts, three-phase current. The dam is now under construction. It is to be of concrete across the Sturgeon river, where its banks come within 175 ft. of each other. The dam will be 31 ft. thick, and will run straight across the river and will give a head of 22 ft. Water will be delivered to the power-house through a canal about 250 ft. long, and this is now about completed. The plant will be in operation some time in the fall of 1906.

The Oliver Iron Mining Co.'s Riverton mine, Menominee range, has recently opened what seems to be a fine body of its standard grade ore. The discovery was by drill at depth, and little is actually known as to the extent of the deposit, but its indications are for a considerable tonnage. This is but one of a number of excellent finds that are now being reported from points on the Menominee range, by various explorers and mining companies. The Saginaw and Caspian discoveries are others.

Platteville, Wis. Dec. 2.

The annual stockholders' meeting of the Empire Mining Co. was held at Platteville this week, at which another $10 dividend was declared, making the third during the month of November. The old officers were re-elected, Fred Krog being retained as president. The total dividends paid out for the month of November amounted to 50% of the capital stock; $15,000 being the exact amount paid to the stockholders on a total investment of $30,000.

The Ebenezer mine, located in the Livingston camp, reports a rich run of zinc and lead. The shaft is now down to the 80-ft. level. It is the intention to instal adequate pumping and hoisting machinery at once. The best ore lies in what is known locally as the "green bed," the best sheet being about 3 ft. thick.

P. Yeatman of New York, associated with the New Jersey Zinc Co., has been spending several days in the Platteville district. He was accompanied by W. A. Jones of the Mineral Point Zinc Company.

James Harms and two associates have secured several hundred acres of valuable mining land adjoining the Roosevelt mine, in the Cuba City camp. They have formed a prospecting company, known as the Trinity.

The Grant County mine has developed a good orebody. It is reported that an air-compressor plant will be installed in order to facilitate the opening of the ground, and a mill will probably be erected early the coming spring.

The output of lead in the Platteville district increases materially during the winter months, owing to the fact that a great number of the farmers and stockmen resort to mining during the months when it is imposible to do much about their farms.

The Dall Lead & Zinc Co., owning a mine at Meeker's Groove camp, is figuring on the installation of electrical power for the operation of the pumps and hoists.

The Black Hawk Mining Co. held its annual meeting this week, electing Fred Krog as president. The manager reported the property as being in a well-developed condition. It is the intention of the management to instal at once a five-drill compressor plant, and to make the necessary arrangements for a large concentrating and magnetic separating plant, to be erected early next spring.

Scranton. Dec. 11.

There is no doubt that 1905 will be a record-breaking year in the production of anthracite. The total for the first eleven months of the year is 56,011,088 tons, as compared with 52,429,376 tons for the same period of 1904.

A record was made by the Conciliation Board at its recent session in Pottsville, when it held a morning, afternoon and evening session, the meeting being prolonged until midnight in an effort to clear the arrears of business. The board will meet in Philadelphia on Dec. 22 to dispose of all grievances before it. In the much discussed Centralia colliery case the umpire decided against the Lehigh Valley Coal Co., claiming that it had not the right to reduce a rate of compensation established by the award of the Anthracite Commission. The board decided to invite the umpire to attend the next meeting to discuss the question. The gob grievance from the Oak Hill colliery, which is almost as old as the Conciliation Board itself, was again discussed and referred to the umpire. The miners contend that they were paid for lifting the gob prior to the last strike, but that the pay has been withheld since the strike. The company maintains that the men lifted the gob upon the same terms as at present.

A new breaker is being built by the Pine Hill Coal Co. near Minersville, to replace that destroyed by fire recently. It will have a daily capacity of 1,000 tons, and for 75 ft. to the main floor it will be entirely of concrete reinforced with steel bars, known as the Kahn system. The peculiar form of the reinforcement bars used in the construction of this work will, it is claimed, make it impossible for the concrete to disintegrate, and every part is tied together, so that if the least settlement or vibration occurs, it will be distributed over the whole construction. The general construction consists of concrete columns united by concrete arches at the top. These columns and arches form bents, varying in length from 90 to 120 ft., and there are 10 bents spaced 12 and 14 ft. apart, and stiffened laterally by concrete beams. This type of breaker construction, it is claimed, is not affected by the action of the sulphur water. Its strength increases with age. The repair bill, generally a large item, is done away with. The cost of the construction is about 25% more than the ordinary wooden construction.

Chief James E. Roderick, of the State Mining Bureau, held a conference in Pottsville, a few days ago, with the local mine inspectors, for the purpose of arranging for a more rigid enforcement of the child-labor law. He has directed the inspectors to institute prosecutions for each infraction.

Practically all the anthracite railroads have decided to abolish the free-transpor-

tation list. The office of borough and city councilmen will now be far less desirable.

The Lackawanna railroad has placed an order for equipment valued at close to $5,000,000, which includes an order for 50 locomotives from the American Locomotive Co., Schenectady, and from the Barney & Smith Co., Dayton, O., 500 steel gondola cars and 500 steel hopper cars. The Lackawanna will also build 2,600 cars at its shops in this city, and, beginning with Jan. 1, will turn out at least 10 cars daily. Three hundred additional men are to be employed at the Scranton shops.

At a convention of the miners of the first anthracite district, held in Scranton on Saturday, the miners decided to capitulate on the powder-keg question. Some time ago the powder companies notified the miners that they could no longer pay 10c. for the old kegs, but would pay 8c. each. The miners met in a joint convention and decided to refuse these terms, and to destroy the cans. After a few weeks it was found that a large number of the miners were surreptitiously selling their cans to the companies for 8c., their complaint being that their wives wanted the cash and compelled them to take what they could get. At Saturday's convention the ladies seemed to rule, as all decided to sell for 8c. More than a million kegs are used in the anthracite region during the year.

Toronto. Dec. 6.

The extension of the Timiskaming & Northern Ontario Railway, which has now reached a point some 40 miles north of New Liskeard, in the Temiskaming district, is likely to open up a new field for silver-cobalt prospectors in the spring. The formation of the district tapped is similar to that of the Cobalt area, and many claims have already been located. The town of Cobalt will probably not be so prominent a country for prospecting operations as the end of road. Another field which will be closely prospected will be the region to the south of Cobalt town. The most urgent question confronting the Provincial government is the policy to be pursued with regard to throwing open the Gillies timber limit, covering a large territory a short distance south of the mining area, which undoubtedly contains rich deposits. It has not been cut over for 30 years, and is one of the finest pine limits in New Ontario. Gillies Bros. paid about $438,000 for it, and are said to value it at about $1,000,000. The Government would, of course, be responsible for any active interfering with their rights to the timber or resulting in its destruction. If their claims were compromised and the limit thrown open to prospectors, the greatest confusion and very probably bloodshed would result, as the location of rich veins is known to many prospectors, some of whom had filed applications before the limits were prohibited, and therefore claim priority. It appears probable that if the limits are thrown open the existing method of allowing locations will have to be abandoned and some other plan adopted, possibly the sale of locations by auction to the highest bidder, which would be unpopular, as tending to exclude the poor prospector. The problem of how to reconcile conflicting interests is a very difficult one.

The Arsenical Ore Reducing Co. is actively developing its property at Grey's Siding, 2 miles north of Temagami. Over 50 men are at work, under charge of Albert Smith, a New York engineer, and the capacity of the plant is being doubled. A deposit of iron pyrites at Rib lake, in the same neighborhood, is being developed by Mr. Smallman, of London, who has made a trial shipment to Buffalo.

There are now 25 working properties in the Cobalt mining area. At La Rose mine the Government diamond drill is in operation at the bottom of the shaft, which is 90 ft. deep. The drill has gone down 100 ft. further. The vein being less than 1 ft. in width, it is impossible to keep the drill in the vein matter, and all that can be ascertained from its operations is the character of the rock formation at the lover levels. So far, there has been no change whatever in this respect, so that it is assumed that there is no break in the continuity of the vein. As the summit of the vein is 100 ft. above the mouth of the shaft, there is reason for believing that the depth of the vein is at least 290 ft. In the course of working, the ore has been found more plentiful and at least equally rich with that nearer the surface. The ore on hand awaiting shipment at this mine is now valued at $250,000. There are at present 55 men employed. Two 50-h.p. boilers, with engines and compressing plants, are being installed at the O'Brien mine, which was apparently petering out at a depth of 50 ft. The vein, however, improved at a lower level, yielding more than ever. George Glendenning, of the University mine, is in New York, disposing of a carload of rich ore recently shipped from the mine.

Dr. Robert Bell, acting director of the Dominion Geological Survey, who recently visited the Cobalt area, though reticent in giving any opinions in advance of his official report, expressed his surprise at the results of his investigation. He was struck by the frequency of the veins and great variety of metals contained in the ores.

Victoria, B. C. Nov. 13.

Trail.—The receipts at the Canadian Smelting Works, during October, of ores containing lead, aggregated 2,313,682 lb., from which 944,852 lb. of metallic lead were obtained. The chief producing mine was, as usual, the St. Eugene, situated in East Kootenay, with a total for the month of 1,340,735 lb., yielding 731,282 lb. of lead. Among the 20 properties which shipped ore to Trail were 9 which had not previously been shippers.

Developments at the Ymir mine, owned by the Ymir Gold Mines, Ltd., of London, England, continue to be satisfactory. Robert Gilman Brown, of San Francisco, recently reported on the property under instructions from the directors, and his report was encouraging. Beside the new orebody lately discovered on the 500-ft. (No. 5) west level, another find has been made, this time on the 600-ft. level. Each of these ore-shoots is about 5 ft. in width, and while ore of both is similar in general character and value, they appear to be separate shoots. Values are stated to run from $12 upward; an average value of about $15 per ton is looked for by the manager, E. M. Hand, who only recently took charge of the company's mine and 80-stamp mill, and its cyanide plant with a full rated capacity of about 200 tons a day. Work is being pushed on the 500-, 600- and 1,000-ft. levels westward, in which direction it is believed much ore of a payable grade will be met with.

Coast.—The Tyee Copper Co.'s smelter, at Ladysmith, Vancouver Island, ran 16 days in October and treated 2,975 tons of Tyee ore, which gave a return, after deduction of freight and refining charges, of $51,237.

What is stated to be one of the most important decisions, from a mining standpoint, ever given in the Dominion is a recent judgment by the Supreme Court of Canada in a case which was a test case, the result of which is, by consent, to govern 13 others. This court practically decides that in mineral claim location cases technicalities shall not prevail. According to a press despatch from Ottawa, the court finds specifically in location cases:

1. That 70° is too great a variation to allow as an approximation, though no exact limit was fixed. In the case before the court 97° was the point involved.

2. That a location may be wholly on one side of location line.

3. That a location line may traverse any number of claims.

4. That a discovery post may be even located on a Crown-granted (patented) claim.

The decision is stated to be clear that such ground as may be lawfully covered by the location is to be allowed. The case dealt with was that of Docksteader vs. Clark, which had been before the British Columbia courts for years.

Slocan.—J. A. Whittier, manager of the Goodenough Mines, Ltd., operating in the Slocan district, recently shipped from that company's Grey Copper mine the first car of zinc ore to reach the Canadian Metal Co.'s zinc smelter lately erected at Frank, Alberta. This ore was treated at a preliminary run of the Frank works and the resultant pig zinc was the first metal of that kind produced in quantity in Canada. This is not Mr. Whittier's first pioneer

achievement, for he shipped, years ago, the first car of ore sent over the Kaslo & Slocan railway.

Mexico. Nov. 27.

In Sonora it is understood that the York group of mines, consisting of 175 pertinencias (425 acres) of gold-bearing property, about 85 miles south of Douglas, Arizona, has been sold for $200,000 gold, to O. L. Neer and associates of Cincinnati, Ohio, who are also largely interested in the Transvaal Copper Co., near by, and that a stamp mill will be erected as soon as the development work on the property warrants. The mines and smelters of the Transvaal Copper Co. have been put under the general management of Arthur W. Jenks, formerly superintendent of the smelters of the Peñoles Mining Co., at Mapimi, Durango, and he is already getting together his staff, preparatory to blowing in the copper furnace at Cumpas. At the Lucky Tiger B. F. Graham is still in possession of the property, though the preliminary hearing was had in Nacozari the week before last. Mr. Graham is out on bail, and has both the original owners and the more recent Kansas City purchasers to fight, which latter were until about three months ago in possession of the mine, and are closely allied to the A. E. Stillwell, and Mexico, Kansas City & Orient railroad interests. The Kansas City people bought from Graham and associates, who had the option, and at the time of the last payment of about $40,000 gold, which was in the bank in Douglas, Graham refused to accept the payment for his associates, whose powers of attorney be held, claiming that payments must be made to the individuals in person, and, as this was not done, he took forcible possession of the property and has been working it since that time, though with difficulty disposing of the ore, as intending purchasers of the ore fear suits later. Those best posted say Graham has no claim whatever, and that it is all a farce-comedy for which he will eventually have to pay.

In Chihuahua final payments have been made by H. E. Carey and associates on the Lluvia de Oro, which was taken up a little over two years ago and for which $2,000,000 gold has now been paid. These holders consist of H. E. Carey, New York, president and general manager; James Campbell, St. Louis, secretary and treasurer, with B. F. Yoakum and John Scullin, of St. Louis, and Fred Edey, New York, as directors. They have organized the company with $10,000,000 gold capital.

At Ocampo the properties of the Watterson Gold Co., incorporated in 1902, have been taken over by the Watterson Gold Mining Co., Ltd., organized in London in September, with £125,000 capital, by J. Lawrence, A. T. Thompson, W. R. Graff, E. W. Davey, W. A. Gregg, T. H. Ridge, and C. W. Milne, all of London. The old amalgamating plant will be remodeled, work on the mines will be resumed, after several months' shutdown, and a cyanide plant will be put in to treat the tailings.

H. P. Lewis, general manager of the National Metal Co., is quoted as saying that their new lead refinery, located at Nonoalco, near the City of Mexico, is completed and will start under the superintendence of D. C. Doney. This is the first purely custom lead refinery on a large and modern scale in the Republic of Mexico, and as the products will be sold mostly in the Republic, thus saving considerable freight on the lead, and export tax on the gold, it is expected producers of bullion will obtain considerably better treatment rates than heretofore.

Excellent authority has it that W. C. Potter, who was but lately appointed general manager of the Guggenheim Exploration Co., to succeed the late Edward Doerr, is now to succeed W. S. Morse as general manager in Mexico for the entire interests of the American Smelting & Refiining Co., including the American Smelters Security Co. (which has taken over the Guggenheim Exploration Co.). Mr. Morse takes an extended trip to Europe for his health and then takes a position in the New York office of the company.

Another large tract of ground in the Cananea district of Sonora is soon to be exploited by Archibald & Marshall, of London, who, through Chas. Dobson and G. Oddie, have obtained a 65% interest in 900 acres of mineral land adjoining the Greene Consolidated Copper Co. holding at £60,000; an additional £40,000 will be spent in development work. Mr. Oddie is the recently appointed general manager of the Cuadras mine of Parral, Chihuahua.

In Michoacan, M. Elsasser & Co., of Mexico City, have finally decided to erect a new smelter at Angangueo, or Trojes, in place of the old plant, and the first stack, 42 by 162 in., water jacket has been ordered.

London. Dec. 2.

From time to time efforts are made to revive British metalliferous mining. Most Americans, in fact people generally, have forgotten that there are any mineral deposits in Great Britain other than coal, iron ore and tin. There are, however, gold veins in Wales, Scotland and Ireland, and copper, lead and zinc veins in many parts of the United Kingdom. Their economic value is determined by all sorts of restrictions, such as landlords' dues, the prevention of pollution of rivers, and the preservation of beautiful scenery. During recent years several new gold mines have started work in Devonshire, Cornwall and South Ireland. At the present time a number of revivals of old mines are in progress. In Cumberland, in the northern portion of the Lake district, several of the Caldbeck mines are being re-opened. In the old days the lead produced here was considerable. Zinc occurs in them as well, and it used to be all thrown aside or left in the stopes. The zinc is now being worked by people acting for a leading firm of chemical manufacturers in Birmingham, who take all the product. Another mine there is being worked for wolfram by a London firm of metal merchants who have connections in Germany. Proposals are being made to re-open the Knockmahon and Tankardstown copper mines near the sea-coast in Waterford, Ireland. These mines were worked for 40 years from 1824 to 1865, during which time the receipts for ore sold in Swansea amounted to £1,400,000, of which 40% was clear profit. From 1865 to 1878 the mines were under different ownership and the receipts from sales were over £900,000. The company got into financial difficulties through other entanglements and went into liquidation; since then nothing has been done until this summer. No very recent examination of the property has been made by independent mining men, so what success will attend the new venture remains to be seen.

The benefit reaped by the Broken Hill companies from the operations of the newly formed Zinc Corporation may be gauged by the particular case of the British Broken Hill Proprietary. The Zinc Corporation buys the whole of the dumps, amounting to 375,000 tons, and the output of tailing for three years from Oct. 1, 1905. For this they pay the company £150,000, payable in instalments during the three years. The company (which must not be confounded with the big company of similar name) was floated in London in 1885, but never paid any dividends until 1897. In its early days great losses were made and in 1895 four-fifths of the capital was written off as lost. The nominal capital now stands at £264,000, and the dividends distributed to date amount to £165,000. It will be seen, therefore, that the sale of the tailings is a considerable windfall for shareholders, and they are wise to sell the tailings instead of treating them themselves.

I have recently mentioned in these columns the progress made in Egyptian mining operations, and have mentioned particularly the Um Rus and the Om Nabardi mines. Information is now at hand relating to the Um Garaiart mine. These are really the only mines in Egypt and its dependent territory, for though exploration work is going on extensively, nothing else has yet been found that can be actually termed a mine. The first two named are under the management of John Taylor & Sons, and the third is in the hands of Lake & Currie. The chief characteristic of the Um Garaiart mine is the wide fluctuations in the values of the ore. It is one of those extreme cases where the closest sampling is valueless. A large amount of work has been done. Five shafts have been sunk. The 100-ft. level extends 1,400 ft., and the 150-ft. and 200-

ft. levels about 500 ft. each, besides which there are a number of winzes connecting the levels. The nature of the ore can be gauged by the fact that of 10,650 tons of ore extracted and treated, 94 tons produced 9,242 oz., 371 tons produced 761 oz., and 870 tons produced 447 oz., which may be classified as phenomenally rich, high grade and low grade, respectively. In sampling the mine, all assays over 2 oz. are discarded, with the result that the average of the ore blocked out does not run much over 10 dwt. It is difficult to say what the cost of treatment will be exactly, but from general considerations it is hardly possible that anything less than 10 dwt. would pay It is obvious, therefore, that the future success of the mine depends entirely on the presence of shoots and patches of high-grade and phenomenally rich ore. Developments will have to be conducted on such lines as are most likely to find such bodies.

Cripple Creek. Dec. 9.

Operations in mining circles have been quite brisk during the past week. A circular has been issued to the stockholders of the Gold Coin enclosing a dividend derived from the sale of a part of the Gold Coin property to the Granite Gold Mining Co. This dividend was for 10c. per share. The property sold included that part of the mine on which the main shaft of the Gold Coin is situated. The circular stated that the reasons for the sale were that the heavy indebtedness of the company could be raised and that there was a large area of good property still left. For some time past the Granite Co. has been working a part of its property through the Coin shaft.

The Golden Cycle and the Theresa have ended their litigation by the purchase of the latter property by the former company. It is understood that the price was about $500,000. This settles some costly apex litigation. It is also reported on good authority that parties heavily interested in the Golden Cycle have purchased the Telluride mill, situated near Colorado Springs. This mill has been idle for some time, having gone into bankruptcy several months ago. It has been rumored that the Golden Cycle was to build a mill.

New York. Dec. 13.

Activity in mining continues, and increased general interest is everywhere manifest. One of the events of the month was the meeting of the American Mining Congress, at El Paso. It was a lively meeting, and there was a smaller proportion of outsiders present than usual. The general tone of the resolutions passed was in favor of more government assistance to the mining industry. Something was done, however, to put the Congress on a more stable basis, and there were some good papers presented.

In California the rains have brought promise of better conditions, but many mines are still troubled by short water supply. The oil industry is active, and several new pipe lines are to be built to serve different districts. New steamers to transport oil to coast ports, and for export have been started. State Mineralogist Aubury continues his war on "fake" mining companies, and some convictions have been secured.

The Anti-Débris Association, which has long fought the hydraulic miners in California, has begun to extend its activity to the dredges. There is a prospect of a stiff fight if the attempt to stop dredging is continued.

Arizona copper production continues to grow. Several of the new mines in the Bisbee district are coming in as producers. The Calumet & Arizona has voted to increase its capital by the issue of new stock to pay for increased smelting capacity and other improvements.

In New Mexico there is more activity than for some time past, especially in developing copper prospects. The old mines at Hanover are now shipping zinc ore regularly. New coal developments are also reported.

In Utah, copper is also the main topic, especially in connection with the Bingham and Tintic districts. Confidence in the future is shown by the large increase in smelting capacity now being made. The Consolidated Mercur is showing unexpected improvement in its orebodies. At Park City the cave in the Ontario drain tunnel has at last been repaired, enabling that mine to resume work.

In Nevada, there is renewed life everywhere. Not only are Tonopah, Goldfield and Bullfrog active, but prospecting is going on all over the State. Old mines are being re-opened, and new ones developed on a large scale. One of the more important points is the opening of mines which give promise that Nevada will be a large copper producer in the future.

In the Butte district copper production goes on steadily. There is much interest in the formation of new companies, to work old mines, or to open up territory not yet touched.

In Colorado, the Cripple Creek mines are doing well. No final decision has been reached yet as to the new drainage tunnel. Leadville is very prosperous, and its ore shipments are heavy. The latest developments are a renewed and urgent demand for manganese ores. In Gilpin county work is active, and the same thing may be said of the San Juan country.

In Oregon, the district around Baker City is showing new and better work. The Washington mines are also doing better than for some time. An interesting feature in Washington is the opening of a large tungsten deposit.

Idaho mines will show a good record for the year, with the prospect of a still better one for 1906.

In Missouri, the Joplin district has recovered from the October floods, and continues to rejoice in high prices for its zinc ores. The lead district of the southeast is doing extremely well, in view of the strong demand for the metal and its high price. The Wisconsin zinc and lead district is also doing very well, and is the scene of much new work in exploration and development.

The Lake copper district shows a larger production than ever before, and its old mines are being worked to their full capacity. Plans are also being made for the working of new properties, which will add considerably to the area exploited.

The Lake iron district is closing its most prosperous season. The shipments of iron ore will probably reach the great total of 34,000,000 tons. Many costly improvements are being made in the mines and their equipment; in these electric power will have a large place. At the same time the search for new orebodies is active, not only on the newer Mesabi, but on the old ranges in Michigan and Wisconsin.

Coal developments in the West have been chiefly in the way of consolidation of coal properties, largely under railroad control. This movement is going on chiefly in Indiana and Illinois. The conference at Chicago, which was intended to unite the coal operators, in view of coming negotiations with the miners, was not a success. The Ohio and Pennsylvania operators did not give their support, leaving the western coal men to act alone. The demand for coal has been large and mining is hampered only by the inability of the railroads to furnish transportation.

In the anthracite region it is now certain that the production for the year will exceed 60,000,000 tons. Not for many years past has there been so much activity in the opening of new colleries, the building of new breakers and other improvements. Another year will see the region in shape for a further increase in production.

Across the border, in Canada, mining is also active, notwithstanding the coming of winter. The Cobalt district in Ontario is doing remarkably well, and the development work is encouraging. With the spring there is little doubt that other districts will be opened in New Ontario and Quebec.

In British Columbia conditions are improving, and we hear of new mines, of the working of old mines, of the extension of smelting works and other improvements.

The markets for the past month have been interpreters of general prosperity. The demand for copper, lead and spelter has been extraordinary, and has resulted in strong advances in prices for all these metals. In copper especially it seems difficult to satisfy the demand. The same condition prevails in the iron and steel markets. The amount of new construction going on all over the country is extraordinary, and this is reflected in the demand for materials everywhere.

General Mining News.

Lake Superior Iron Ore Shipments.—The shipments of iron ore from Lake Superior ports for November were 3,341,229 tons, an increase of 138,816 tons over November, 1904. For the season up to Dec. 1 the total shipments were as follows:

Port	1904.	1905.	Changes.
Escanaba	3,506,923	5,176,385	I. 1,669,462
Gladstone	480	.....	D. 480
Marquette	1,866,891	2,925,250	I. 1,058,359
Ashland	2,269,987	3,460,120	I. 1,190,133
Superior	4,132,064	5,043,234	I. 911,170
Duluth	4,574,012	8,767,706	I. 4,193,694
Two Harbors	4,509,872	7,699,149	I. 3,189,277
Total	20,860,229	33,071,844	I. 12,211,615

Gladstone has ceased to be a shipping port this year. To this total of the present year must still be added the December shipments, which will approximate 500,000 tons. The movement this year will therefore be 6,000,000 tons greater than the record-breaking year of 1902, when 27,500,000 tons were moved. To these figures, of course, must still be added the total movement by rail, so that the maximum movement for 1905 will probably be 34,000,000 tons.

ALASKA.

PRINCE OF WALES ISLAND.

The first cargo of matte produced in Alaska was shipped to the Tacoma smelter a few weeks ago, by J. Cuthbert Welch, manager of the Alaska Copper Co.'s smelter, at Coppermount, Prince of Wales island, southeast Alaska. The shipment consisted of about 170 tons. More development work, preparatory to ore production on a commercial basis, has been done this year in the Ketchikan district (which includes Prince of Wales island) than ever before. As the district gives promise of proving productive to a considerable extent, the beginning made as above-mentioned is worthy of record and may later be regarded as an interesting historical fact.

ARIZONA.

MOHAVE COUNTY.

Lehigh & Arizona.—This company has bought the Minnesota & Connor group of 16 claims in the Chloride district. Franklin H. Griffith is vice-president and general manager in charge. On this property the main shaft is down 565 ft. and there are 3,000 ft. of drifts. There are two other shafts, respectively 300 and 700 ft. south of the main shaft, with 1,200 ft. of drifts. The mill is a concentrating plant. It is equipped with Blake and Gates crushers, roughing and fine rolls, an Elspass mill for re-grinding, Wilfley and Woodbury tables and Frue vanners. Power is furnished by three boilers of 125 h. p. each, using crude oil for fuel, and a Hamilton-Corliss engine of 200 h. p. Water from springs is pumped to a reservoir holding 200,000 gal. The concentrates, with some picked ore, are shipped to the smelter. Stoping to supply the mill is going on steadily, and development is to be pushed.

Pinkham & Midnight Group.—This group, in the Chloride district, is operated under lease and bond by G. H. Hooper and R. G. Eckers, of Los Angeles, Cal. There are two shafts, each 250 ft. deep, and about 1,200 ft. of drifting on a vein carrying iron and copper pyrite, with silvery values. Fairbanks gasolene hoist is in use.

Samoa.—This mine, in the Chloride district, is now making regular shipments of ore to the smelter at the Needles. It is owned by the Chloride Mining Co. The shipment last month was four carloads.

St. Louis Consolidated.—This property, in the Walapai district, is being opened by two adits. One is now in 400 ft. and the second 225 ft. The work is done by contract. The vein carries chiefly silver values, with some gold. T. R. Garnier, of Los Angeles, Cal., is owner.

ARKANSAS.

LOGAN COUNTY.

In the semi-anthracite field of coal, near Prairie View, options on about 15,000 acres of coal property have been secured and $25,000 already expended in preliminary investigations. Reports state that H. L. Remmel, Gen. Powell Clayton, E. G. Thompson, of Little Rock, and others, are promoting a company to develop this property.

CALIFORNIA.

CALAVERAS COUNTY.

Lightner Mining Co.—At this mine, Angels, Alex. Chalmers, superintendent, the blacksmith shop and new hoist are nearly completed, and grading for the mill and concentrators is completed. Eighty men are at work. The surface plant of this mine was recently destroyed by fire.

EL DORADO COUNTY.

Rio Vista Copper Co.—This company has closed down its property, but all labor and other debts have been paid. It was organized as a non-assessable company, and no debts could be incurred in excess of funds in the hands of the treasurer. The close-down is thought to be but temporary, as treasury stock will be sold to raise funds.

Gravel Hill.—J. W. Brown and Fred Smith, of Oakland, have bought a half interest in this claim, and work has commenced under the new management, with S. G. Sturman as superintendent.

INYO COUNTY.

Beveridge District.—In this district a strike has been made of 2 ft. of high-grade ore in the California-Nevada Mining Co.'s property.

Mount Whitney Mining Co.—This company at Lone Pine has 125 tons of rich ore on the dump, and is opening the stopes for more ore when the new mill is ready. Some of the machinery is on the ground, and the frames are being put up.

MONO COUNTY.

Liberty Group.—For this mine, Masonic district, arrangements are being made for a 10-stamp mill. Ore from the district is now being shipped to Reno, with 100 miles teaming to railroad, the cost of shipment being $22 per ton. This will be the first mill in the district.

NEVADA COUNTY.

Zeibright.—At this mine, 15 miles from Nevada City, M. J. Dunn, superintendent, the pay-shoot has been encountered again in a crosscut from the face of the tunnel. The vein is 14 ft. thick at that point and a good orebody is being opened up.

Union Consolidated Mining Co.—In this mine, near Nevada City, Geo. A. Nicholl, manager, they have installed a supplementary pump, and have leased the 10-stamp mill on the Sneath & Clay mine, which will be started up at once. Ten miners are employed at present, but as fast as ground can be opened this force will be increased.

Brunswick Mining Co.—At this mine, Grass Valley, C. H. Mallen, superintendent, the monthly mill product has risen from $6,000 to $20,000. Development has recently been made in new ground on the 1,200 level. The vein is supposed to be a continuation of that of the Eureka-Idaho-Maryland.

Morning Star.—This mine at Badger Hill, worked under a bond by a company of which P. Deidesheimer is manager, has been closed down owing to levying of attachments. Some 60 men have been employed, and there is a large amount of new machinery and a quartz mill. The miners think the mine will not be long closed, as there is a good ledge in the bottom of the shaft.

Banner Mining Co.—This property, now being re-opened under a bond, has been unwatered to the 600 level in the north shaft, and the 520 ft. in the south shaft. The mine was worked from 1865 to 1872, but has since been idle until the present company took hold last July.

PLACER COUNTY.

Good Friday.—F. X. Lavelle, owner of the Green mine, has purchased this property at Ophir.

Devil's Cañon.—Henry Henning & Co. have obtained a permit from the California Débris Commission to hydraulic a claim in Devil's Cañon, Forest Hill. The new dam has been completed.

PLUMAS COUNTY.

New York.—This mine, near Greenville, has recently been sold and the purchasers expect to put up a mill shortly.

RIVERSIDE COUNTY.

Arlington Mining Co.—At this property,

Perris, a new 10-stamp mill is about to be erected, there being a sufficient quantity of ore blocked out to keep it running. Two new boilers are to be installed, with oil fuel furnaces. The main tunnel is now in over a half a mile, and this will be straightened, and another tunnel started 200 ft. above.

SISKIYOU COUNTY.

Oregonian Group.—In these mines, Salmon River district, R. McDonald, manager, a large body of sulphuret ore has been uncovered. There is some free gold, but the sulphurets will be sacked and shipped to the smelter for the present.

TUOLUMNE COUNTY.

Elkins Mining Co.—This company has purchased the four New Tonopah claims on the American Camp side of the Stanislaus river, near Pine Log. W. S. Elkins is superintendent. The ledge so far uncovered is reported as 8 ft. in width. A tunnel is soon to be started on the west vein, and this will be followed by the erection of a mill.

COLORADO.

GILPIN COUNTY.

After Supper.—We are informed that an item which appeared in this column on Dec. 2, stating that a transfer of this property had been made, was incorrect. Louis R. Tatum, president of the Banzai Mining Co. writes that the title to the After Supper property is fully and completely vested in that company; that no transfer has been made, nor is there any intention of making such transfer or sale. We are pleased to make the correction.

LAKE COUNTY.

Iron Silver Mining Co.—This company has declared regular dividend No. 44, of 10c. per share; also an extra dividend of 10c. Both are payable Jan. 1 next.

SAN MIGUEL COUNTY.

Butterfly-Terrible Gold Mining Co.—This company's property, located at Ophir Loop, 14 miles from Telluride, is now worked almost exclusively by leasers, who are keeping from 10 to 20 stamps of the company's 30-stamp mill, connected with the mines by a wire-rope tramway 1,300 ft. in length, dropping the greater portion of the time. The ore runs largely in gold, from $8 to $30 to the ton, and the lessees are reported to be doing well. The company is driving a long tunnel, the portal of which is at the mill building, for the purpose of cutting the ore-shoot 750 ft. below the lowest of the upper workings, but slow progress is reported, although machine drills are employed and an air compressor. It will be necessary to drive 2,500 ft. to encounter the edge of the shoot, and the tunnel is now in about 1,000 ft. F. J. Keating, whose post-office address is Ames, Colo., is superintendent of the property.

Contention Group.—Exploration work, which has been carried on in this property during the summer and fall by the Goldfield-Rex Mining Co., A. A. Clute, of Telluride, manager, has been discontinued for the winter. The company has been exploiting the group with a view to leasing. It is owned by the Smuggler-Union Mining Co., which four years ago erected a wire-rope tramway upwards of two miles in length, at a cost of $35,000, connecting it with the Smuggler-Union mills, at Pandora. It is a gold proposition.

Menona Mining & Milling Co.—An agreement has been made between John B. and John P. Olson, of Telluride, and this company, by which the former are to take a lease on the Columbia-Menona group of mines and 30-stamp mill, located in Savage basin, 5 miles from Telluride, and the papers have been sent East for the president of the company to sign. The group embraces 3,700 contiguous ft. on the Columbia-Menona vein, which is from 2 to 8 ft. wide, carrying gold, silver and lead values. It is an amalgamating and concentrating ore, most of the gold values being free, but low-grade. When operated heretofore, some of the concentrates have yielded 60% lead, with large silver values. In places the ore runs principally in gold, while in other sections the values are mostly silver and lead. A crosscut tunnel starting into the mountain, at and on a level with the upper story of the mill building, intersects the vein 800 ft. below the upper workings and 1,400 ft. vertically beneath the surface. The property will be worked through this tunnel, drifts having been run on the vein for hundreds of feet both ways from the intersection. Both the mines and mill have been idle for several years, and the lessees will devote the winter to getting the underground workings and mill in condition for extensive operations early next spring, there being no water for the mill from December to April, on account of freezing weather. The high-grade ore taken out this winter will be shipped to smelters. A. Miner Wellman, of Friendship, N. Y., an officer and large stockholder of the company, has been in Telluride recently, and declared that if the property was not leased the company would resume operations.

Smuggler Union Mining Co.—A large electric hoist is being installed in the place of the old steam hoist in the Union shaft of this company, which is interfering in a slight degree with operations, though the 60 stamps in the new Smuggler mill and 60 stamps in the old Smuggler 80-stamp mill are kept at work. The boilers of the old steam plant are about worn out from long-continued service, and to obviate the expense of getting new ones up the trail to the mine and through the long Bullion tunnel into the interior of the mines, the manager of the company, Bulkeley Wells, of Telluride, decided to put in an electric hoist. The Smuggler-Union mines are being worked exclusively by lessees, who are obtaining satisfactory results. Messrs. Robeson and Carter have the largest territory, and their output is supplying 60 stamps of the mills. King & Lindsey, who have a lease on a large section of ground in the Sheridan and Mendota, Smuggler-Union properties, on the Smuggler vein, are sending a sufficient tonnage to the mills to keep 30 stamps going. They will sink the Mendota shaft, which is down 360 ft., 300 ft. deeper. Wagner Brothers, and the Goldfield-Rex Mining Co., lessees of different portions of the Smuggler-Union mines, are also sending ore to the mills for treatment.

KENTUCKY.

BELL COUNTY.

Shamrock Coal & Coke Co.—This company, recently organized at Middlesboro, has leased about 1,000 acres of coal property and will instal a mining plant, to facilitate its development. It is stated that there are three workable seams of coal on the tract, running from 4 to 5 ft. in thickness, and the company expects to bring its mine to a production of 750 tons per day. Arrangements have been made with the W. J. Oliver Manufacturing Co., of Knoxville, Tenn., for the necessary machinery. Officers of the company are: J. L. Manring, president; J. H. Ralston, vice-president and treasurer; William Costello, general manager. J. C. Richardson is the engineer in charge of construction.

LOUISIANA.

CALCASIEU PARISH.

Jennings.—The production of this field is holding up remarkably well, remaining at about 27,000 bbl. daily. It is announced that the Texas Co. will commence the immediate construction of a pipe-line from Beaumont to Jennings and have it in operation in 90 days. As most of the crude has heretofore been shipped by rail, a pipe line of large capacity will be of great benefit. The storage here is about 7,000,000 bbl., the production large and shipping facilities inadequate. Shipments by water have been small and the Bass & Co. pipeline to the Mississippi is only capable of handling a portion of the output of its owners.

MARYLAND.

ALLEGANY COUNTY.

Maryland Coal Co.—This company has declared the regular semi-annual dividend of 2½%, with an extra dividend of 2%. This will make a total of 8% paid for the year.

MICHIGAN.

KEWEENAW COUNTY—COPPER.

Keweenaw Copper Co.—Negotiations in which Thos. F. Cole, of Duluth, president

of the Oliver Iron Mining Co. and head of the Calumet & Hecla group at Bisbee and the North Butte, at Butte, has been chiefly instrumental, have been closed this week. They will result in the reopening of old copper mines on the outer end of Keweenaw point, Lake Superior, and may have an important bearing on the extension of the copper lodes of the Lake, especially when taken in connection with the work recently undertaken in the same locality by the Calumet & Hecla.

Little more than a year ago C. A. Wright, of Hancock, Mich., grouped the easterly half-dozen copper prospects of the Keweenaw district into the Keweenaw Copper Co. He had just been rounding up the properties that have since gone into Calumet & Hecla ownership, and was familiar with the situation. The district was, in the early days, quite prominent, but the finds of richer amygdaloid further south, and later, the discovery of the rich Calumet conglomerate, diverted attention for many years. It is just now that interest is again awakened in that part of the lake copper region. Mr. Wright organized the Keweenaw Copper Co. with $10,000,000 capital in 400,000 shares, and 150,000 shares were issued, as follows To the Boston underwriters, 60,000; for public sale, 60,000; Lac La Belle Railway purchase, 15,000; promotion and other fees, 15,000 shares.

The public took only about 12,000 shares, and the underwriters were obliged to take up and pay for the 108,000 shares remaining out of the public and their own portions. They had taken all but 43,200 of these when Thos. F. Cole and associates agred to become interested, providing they could have a majority. The 43,200 shares were turned over to them at the underwriting price of $5.50 per share, a further issue of 50,000 shares was made, which Mr. Cole and party took a few days ago, and 7,000 shares more were made up from the underwriting holdings to give them a bare majority. The company now has, therefore, 200,000 issued shares of a par of $25 each.

Associated with Mr. Cole in this enterprise are John D. Ryan, of the Amalgamated Copper Co. and some friends represented by him; some of the United States Steel party formerly associated with Mr. Cole in Arizona and Montana copper—D. G. Kerr, D. M. Clemson, Jas. Gayely, and possibly others; and Messrs. Hoatson and Collins, of the Lake, connected with Mr. Cole in the other enterprises mentioned, and a very few others.

Included in the deal are the 1,120 acres of land of the Resolute Copper Co., which were under option and which lie close to the Keweenaw properties. For these lands $200,000 is understood to have been paid. Resolute has done some work and has an old shaft nearly 400 ft. deep, with 2,000 ft. of drifting. At present five diamond-drills are working on the lands of the consolidated company. The Keweenaw Copper Co. owns the Lac La Belle railroad, which is under construction along the easterly part of Keweenaw point to a good harbor at Lac La Belle, and which will open the various mining locations on the outer end of Keweenaw point. The district has suffered from lack of railway facilities, but now it is to have, not alone the Lac La Belle road, but a branch of the Mineral Range road, which is owned by the Canadian Pacific.

MONTANA.

Advance figures from the report of State Mine Inspector William Walsh show that there are 15,480 men employed in mining in the State. There were 89 accidents reported. The number of men killed was 48, an average of 3.10 per 1,000 employed. The causes of these deaths were: Explosions of blasting compounds, 15; fall of rock, 9; caught by cages in shafts, 10; falling down ore chutes, 5; falling down manways, 2; suffocated by gases of foul air, 1; breaking of cables, 3; struck by falling drills, 3. The report urges the need of better ventilation in many mines.

BEAVERHEAD COUNTY.

Silver Fissure.—About 20 men are employed under ground, in development work, and 30 more on the surface buildings. Arrangements are being made to sink a vertical shaft.

GRANITE COUNTY.

Copper Age.—St. Louis parties, who have taken this mine under lease and bond, have begun to extend the adit which was started from Stuart gulch some time ago.

LEWIS & CLARK COUNTY.

Whitlatch.—Machinery is on the ground for the new mill and hoist for this mine at Unionville. The erection of the plant is to be pushed.

MISSOULA COUNTY.

Monitor.—The work of enlarging and re-timbering the old shaft is in progress. It is to be sunk 200 ft. deeper. A new orebody has been struck on the 300-ft. level.

NEVADA.

STOREY COUNTY—COMSTOCK LODE.

Bullion Mining Co.—At the annual meeting, last week, the following directors were elected: Chas. Hirschfeld, William Bannan, B. F. Shaw, A. F. Coffin, and W. C. Ralston. Chas. Hirschfeld was elected president, William Bannan vice-president, W. C. Ralston secretary.

Mexican Mining Co.—At the annual meeting last week the following directors were elected: Chas. H. Fish, Chas. Hirshfeld, H. Zadig, Nat. T. Messer and E. G. Fisher. Chas. H. Fish was elected president; Chas. Hirshfeld, vice-president; Chas. D. Olney, secretary, and A. J. McDonell, superintendent.

ELKO COUNTY.

Elko-Tuscarora Consolidated Mining Co.—This company has been incorporated, with $3,000,000 capital stock, to operate in the Tuscarora district. J. J. Hernan is president, and J. L. Brophy, treasurer; both of Portland, Maine.

OREGON.

BAKER COUNTY.

Pat Mining Co.—Ernest Dale Owen, of Omaha, Neb., managing owner of the Cyclone mine, just west of Baker City, has formed a new company, with a capital stock of $1,000,000, known as the Pat Mining Co., which has taken up the Curtis properties adjoining the Virtue mine and in which they expect to find the continuation of the Virtue ledge. Judge Owen is president and manager of the company, and C. J. Lee the engineer. They will put 18 or 20 men to work, and will sink a 9 by 4½ft. shaft, 200 ft. from which they will run crosscuts north and south, prospecting for the Virtue ledge.

United Elkhorn.—Manager Field, by dint of hard work, with a force of something over 100 men and 50 horses, succeeded before snow came in having every vein in the camp shaped up, so that work can proceed without interruption. He has removed a large compressor plant from the lower camp, on the 2,000 level, near the mouth of the double-compartment tunnel, up to the mine works, where he installed a 75-h.p. electric motor to drive the machinery. He will keep men busy during the winter in the big tunnel, but will operate the air compressor at the mine. Mr. Field has also just put in a movable electric hoist, which will be used in the 300 and 400 levels in handling the ores. He is getting out now over 20 tons of concentrates a day, which are being shipped to the Sumpter smelter, and are hauled by six- and eight-horse teams from the mines, 20 miles from Baker City, for shipment.

PENNSYLVANIA.

ANTHRACITE COAL.

Lehigh Valley Coal Co.—The old No. 1 breaker, at Jeanesville, is to be torn down. It was built in 1865.

Charles Portland & Co. have been awarded the contract to sink a shaft at Primrose colliery from the Mammoth to the Buck mountain vein, a distance of 400 ft. It will be a three-compartment shaft, and the cost of sinking the shaft is estimated at $40,000.

Philadelphia & Reading Coal & Iron Co.—A fine new office building is being erected by this company at Pottsville. The entire basement will be used as a lecture room. Last winter General Manager Richards introduced the innovation of calling together the superintendents and other officials for the purpose of hearing lectures by specialists on mining topics. Special appliances to illustrate the lectures will be installed in the room.

Temple Iron Co.—The closing down of the Edgerton colliery of this company, at Archbald, marks an era in the extreme

northern end of the anthracite field, where the exhaustion of the coal supply will be first felt. The colliery has been in operation for 25 years, being first opened by John Hosie & Sons; later sold to Simpson & Watkins, and in turn purchased by the Temple Iron Co. The breaker will be torn down and the machinery removed.

In the Shaleen case, to which reference has heretofore been made in our columns, the Superior Court of Pennsylvania has declared constitutional the law which provides that a miner must obtain a certificate of competency before he can be employed in the mines; but it also declared unconstitutional that clause which provided that a man must have two years experience in the Pennsylvania mines before receiving the certificate. Under this decision a non-resident may enter the State and immediately sit for an examination, and if able to pass it successfully, would be entitled to receive a certificate of competency. The case will undoubtedly be carried to the United States Supreme Court, so that it will be some years before it is definitely settled.

SOUTH DAKOTA.

CUSTER COUNTY.

Cyohagi Mining Co.—An 8-ft. ledge of quarry on the Bowen property at South main ledge of this property on Iron creek. A large force of men is being employed.

Chicago Marble & Mica Co.—Patent proceedings have been commenced by this company for its principal holdings east and west of Custer. Another test is to be made on lithograph stone taken from the quarry west of Custer.

PENNINGTON COUNTY.

Burlington Co.—This company is preparing to sink a shaft 200 ft. on a free milling vein. Those interested in this company are J. B. Taylor, manager, Hill City; Jos. Hattenbach, J. J. Bentley, N. T. Mason, H. S. Vincent, W. S. Elder, D. A. McPherson, and others of Deadwood.

Rochford District.—Lead people have organized a new mining company to develop 160 acres of mining ground in the Hornblende camp, west of Rochford. Colonel John Skinner, of Rochford, is general manager.

Wealthy.—A carload of machinery has arrived for the Eagle Rock Co.'s mill and hoist at the Wealthy mine. The shaft will be sunk 500 ft. deep.

Canton.—The Canton Mining Co., made up of Omaha capitalists, has started an Advance mill at the mine near Hill City. This is a new mill manufactured by the Downie-Wright Co., of York, Neb., and is the first of its kind in the Hills. It is a slow-moving machine, with a capacity of 100, crushed to 20 mesh, per day. The mine has a shaft 150 ft. deep with a 5-ft. vein of free milling ore averaging $6 a ton. Andrew Anderson, of Hill City, is head amalgamator.

Golden West Mining Co.—This company has closed down for the season, having treated 10,000 tons of ore. The actual cost of mining and milling was 41c. per ton. The ore was carried by tram to the mill, the power being furnished by water. The McCormicks, of Chicago, are in control. Extensive development work will be carried on this winter, and the mill will be started early in the spring.

Gopher Mining Co.—The 10-stamp mill of this company is completed and will soon be in commission. A. D. Arundel, of Hill City, has charge.

Keystone.—Con Liston, an old prospector of Keystone, has discovered a vein of free-milling ore near that place, that resembles very much the first strike of the Holy-Terror mine.

TENNESSEE.

HICKMAN COUNTY.

M. B. Coburn, of St. Louis, Mo., it is reported, has purchased from S. M. Ward and J. J. McGill, of Centerville, phosphate property which will probably be developed.

It is reported that Chicago parties are negotiating for the purchase of phosphate lands, and if the deal is consummated arrangements will be made for mining the phosphate, erecting and operating fertilizer factories, etc. J. O. Reilley Griffith, formerly of Mt. Pleasant, Tenn., is said to be promoting the enterprise.

TEXAS.

HARDIN COUNTY.

Saratoga.—The Guffey Petroleum Co. is constructing a pipe-line from its pumping station to the Santa Fé railway.

The Brice interests have leased Union Petroleum No. 1 to Paul Neighbors, who is drilling it deeper.

W. H. Robinson is down 300 ft. on a well on the Houston Oil Co. property, and the Producers' Oil Co. has started a wildcat well east of the Rio Bravo property.

The H. M. Terry well, on the Cole Oil Co. lease, is down 700 ft. Seven rigs are running, and the daily production is 5,800 bbl., selling price 35c. per barrel.

LIBERTY COUNTY.

Dayton.—Sun Co. No. 6 came in at 710 ft., flowing 3,500 bbl., which flow soon declined to 500, and after a few days to 200 bbl. Average daily output is 700 bbl., most of which is taken by the Security Oil Company.

JEFFERSON COUNTY.

Beaumont.—The action of the Railroad Commission in allowing the International & Great Northern Railway to absorb the Houston pipe-line charges is being vigorously contested by the other Texas railroads, and by all sellers of crude oil other than the Texas Co., which owns the pipeline. James W. Swayne states that the advance in crude prices to nearly 50c. will make it profitable for the Hogg-Swayne Syndicate to drill seven new wells on Spindletop, and that operations will commence this month.

The oil situation has not changed in the past 30 days; decreasing output holds prices steady, and so long as Dayton remains a conundrum, few changes are anticipated.

Output and crude prices are as follows: Spindletop, 4,000; 45 to 50c. Batson, 9,000; 34 to 40c. Sour Lake, 6,000; 44 to 47c. Humble, 23,000; 38c. Jennings, 27,000; 30c. per barrel.

UTAH.

BOX ELDER COUNTY.

Southern Pacific.—A large body of copper ore has been encountered in a tunnel run in this property, located in the Sierra Madre district. The vein shows a width of 26 ft., and is said to carry quite satisfactory values.

JUAB COUNTY.

Bullion Beck Tunnel.—This property is shipping considerable ore.

Ridge & Valley.—The directors of this company have made arrangements to work their property through the Gemini mine A crosscut will be run from the 1,500 level of the latter mine.

PIUTE MINE.

Kimberley Mining Co.—This new company has filed its articles of incorporation, with a capital stock of 1,000,000 shares of $5 each, to operate property in the Gold Mountain district. W. F. Snyder, of Salt Lake, is president of the company.

TOOELE COUNTY.

New Stockton.—The installation of a larger hoisting plant is in progress.

WASHINGTON COUNTY.

Utah & Eastern.—The new tunnel being run to the orebodies is within about 175 ft. of the objective point. The smelter at Shem City is working steadily.

VERMONT.

BENNINGTON COUNTY.

Bennington Marble Co.—This company has located and will open a new marble quarry on the Bowen property at South Dorset. A test core 65 ft. deep was taken out of white and variegated marble. The company has bought a 100-h.p. boiler, two derricks, hoisting power, etc., and stripping will commence at once. A large mill is to be built.

Norcross & West Quarry.—According to *Granite, Marble and Bronze,* what is probably the largest marble core ever taken out in the United States has been cut and removed from this property, in South Dorset. It measures 19 ft. 7 in. long. The place was located 30 ft. below the surface. It is of excellent quality, is cut across the grain, and is perfectly sound.

VIRGINIA.

FAUQUIER COUNTY.

Virginia Exploration Co.—This company is about to begin operations on its prop-

erty at Broad Run. A shaft will be sunk to develop the deposit of copper ore believed to exist. Charles Cadmus is in charge.

WASHINGTON.

OKANOGAN COUNTY.

United Verde.—Some good-looking sulphide ore was found at the bottom of an open cut. The discovery is on the brow of an elevation—a "hogback"—with the foot-wall downhill. A tunnel is in from the opposite side of the hill 150 ft., and will be driven to the intersection of the vein, probably 125 ft. further in.

Similkameen Falls Power & Development Co.—At the annual meeting, held at Nighthawk, Nov. 26, L. L. Work, of Conconnulli, Okanogan county, Wash., Monroe Harman, C. A. Andrus, Dr. L. S. Ecki and H. W. Johnson were elected trustees for the ensuing year. Mr. Harman is manager at the mine.

Ruby.—The lower tunnel is in 951 ft. and is passing through a stratum of massive hornblende. Considerable water is now coming in at the face. In the next tunnel above, a similar stratum of hornblende is the foot-wall formation next the vein. It is now thought the vein will be tapped from 20 to 25 ft. further in.

WEST VIRGINIA.

RANDOLPH COUNTY.

Cardiff Coal Co.—On Dec. 4 the wooden stack of the ventilating furnace at this company's drift mine, near Horton, caught fire, and the mine was filled with smoke, ventilation being cut off. Seven miners were overcome, and five of these were suffocated.

KANAWHA COUNTY.

Virginia-Pocahontas Coal Co.—This company has been at work some time on its new mines, near Coalburg. It is now shipping about 15,000 tons per month. A central power-house and a new tipple are now being built.

WYOMING.

FREMONT COUNTY.

Shoshone Coal Co.—This company is sinking a shaft on its property near Lander. This is on the line of the new extension, which the Chicago & Northwestern Co. is building from Casper to the Wind River country.

PHILIPPINE ISLANDS.

The gold dredge of the Oriental & Masbate Gold Mining Co. has started opertations at Masbate, and the results of the preliminary trials were such that the directors determined to increase its acreage. The company now possesses 1,000 acres of land suitable for dredging. It is expected that as a result of the operations of the pioneer dredge, the work of building additional dredges to work the placer ground in other districts in the island of Masbate will be rushed.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Granby Consolidated Mining, Smelting & Power Co.—At a special meeting of the stockholders, held Dec. 1, it was voted to increase the board of directors from 12 to 15 members: George Crawford Clarke, Sanford H. Steele and Edwin Thorne were elected. The other directors are J. Langeloth, president; Jay P. Graves, vice-president and general manager; Geo. F. Baker, Jr.; H. L. Higginson, Arthur C. James, Geo. Martin Luther, Wm. H. Nichols, W. H. Robinson, John Stanton, A. L. White and Payne Whitney. The stockholders passed a resolution authorizing an application to be made the Legislative Assembly of British Columbia to change the par value of stock from $10 a share to $100 a share. This does not involve any increase in the capitalization, but will simply reduce the number of shares.

The stockholders also voted to amend the by-laws in several respects in conformity with the proposed amended charter. The meeting also decided that hereafter the board of directors, instead of the stockholders, shall have authority to declare dividends. By a unanimous vote of the stockholders a dividend was declared of 3% on the capital stock out of the net earnings of the company, payable Jan. 15.

MEXICO.

Negotiations are pending for shipments of Japanese coke to Mexico. It is said that coke from Japan can be delivered at ports on the Pacific coast at $8 gold, per ton.

With a view to increasing as much as possible the coinage and circulation of gold, the President has issued a decree, temporary in its nature, making new rules regarding the coinage of gold. The substance of the decree is as follows:

Art. 1. Only such gold will be coined as the Exchange & Currency Commission shall, on its own account, enter at the mint, save and except as provided by the first part of Art. 10 of the monetary law of Mar. 26, 1905.

Art. 2. For the coinage of gold, as well as for the interchange of that metal for silver coins, under Art. 11 of said law of Mar. 25, 1905, the gold bars presented must necessarily, besides being of minimum fineness of .994, be malleable and possess the other conditions which the respective regulations require for coinage purposes.

Art. 3. When the Exchange & Currency Commission requests it, gold .900 fine may be accepted for coinage provided that it possesses the other requisites and in the case of gold bars the proper imposts and dues must have been paid.

Art. 4. The refined gold which is excepted from the internal stamp tax in regard to the taxes on, and franchises to, mining, is that which possesses all the requirements laid down in Art. 2 above, and will be applied to all gold bars possessing those requirements, even when intended for exportation.

Art. 5. In neither of the two cases contemplated by Art. 2, the gold must be presented to the City of Mexico mint, where the bars will be weighed, melted and assayed.

Art. 6. Settlement for the bars will be effected at the full value of the pure gold contained therein at the rate of 75 centigrams of gold per peso. When presented for exchange for silver coins the Commission may, at its discretion, collect a charge to cover expenses of shipment abroad.

The gold bars that at present belong to the fund for the regulation of the currency may be coined at once, whatever be their fineness, if the Exchange & Currency Commission so decide.

AFRICA.

TRANSVAAL.

The gold output for November is reported by cable at 424,757 oz. fine; this is 9,230 oz. more than in October, and only 3,824 oz. less than the record production made in August. The total for the 11 months ending Nov. 30 was 4,465,627 oz. fine gold, or $92,304,510; an increase of 1,055,958 oz., or 31% over the corresponding period of last year.

Coal Trade Review.

NEW YORK, Dec. 13.

ANTHRACITE.

The hard-coal market continues to grow in strength under the influence, not so much of the cold weather as of the shortage in car supply, which creates a condition closely similar to the one that may be expected when the blizzard season sets in. All the small sizes are short and of the prepared sizes stove is the scarcest; egg is in fair supply everywhere.

Prices remain at the old level: $4.75 for broken and $5 for domestic sizes. Steam sizes: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice and $1.30@$1.35 for barley. f. o. b. New York harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft-coal trade continues to show a heavy demand for coal. The mild weather so far this winter has helped in getting forward enough coal to supply the demand to a large extent. It is said that a large number of cars thrown out of business by ice-bound conditions in the middle West will now become available in the East, to counter-

act expected delays inherent in our climate.

At times there seems to be some relief from high spot prices, but it is only temporary, since any sharp weather would reinstate them. What few reductions do occur appear in only one or two places at once. Some export is reported but it does not stand high prices and shipments are delayed awaiting lower prices.

Trade in the far East is strong and this region seems to absorb large shipments without weakening the demand. Trade along the Sound is calling for all the coal that can be shipped there. A shortage in Sound boats is said to affect this business somewhat. Trade in New York harbor is easing up slightly, and prices have fallen off 5 or 10c.; current quotations are $2.80 @$2.90, f. o. b. New York harbor shipping points.

All-rail trade is calling for more coal than can be shipped. Producers have adopted a method of adding to the price of coal for delivery by rail in order to hold this business in check. Transportation from mines to tide is good, schedule time being maintained. Car supply is variable, but nobody gets his full requirements.

Large boats in the coastwise market are in good supply, but small ones are scarce, and are booking charters to out-of-the-way places at high figures. Current rates from Philadelphia are: to Boston, Salem and Portland, 80c.; to the Sound, 70@75c.; Portsmouth, 85c.; to Newburyport and Lynn, $1.10 per ton.

COAL TRAFFIC NOTES.

The coal and coke originating on all lines of the Pennsylvania railroad east of Pittsburg and Erie were as follows for the year to Dec. 2, in short tons:

	1904.	1905.	Changes.
Anthracite	4,162,301	4,208,260	I. 45,959
Bituminous	25,095,518	27,735,655	I. 2,640,137
Coke	7,966,234	10,345,634	I. 2,379,400
Total	37,224,053	42,289,549	I. 5,065,496

The increase shown is 13.6% this year.

Shipments of anthracite coal in November were 5,421,584 tons, an increase of 297,516 tons, or 5.8% over November, 1904. This is a high record, especially when it is considered that there were three holidays during the month. For the 11 months ending Nov. 30 the shipments were as follows, in long tons:

	1904. Tons.	Per Ct.	1905. Tons.	Per Ct.
Reading	10,343,278	19.8	11,527,650	20.6
Lehigh Valley	8,717,519	16.6	9,183,971	16.4
N. J. Central	6,576,157	12.6	7,294,948	13.0
Lackawanna	8,546,309	16.3	8,606,889	15.4
Del. & Hudson	4,837,197	9.2	5,188,872	9.2
Pennsylvania	4,363,603	8.3	4,449,749	7.9
Erie	5,221,145	9.9	5,687,993	10.2
N. Y., Ont. & W.	2,410,739	4.6	2,611,323	4.7
Del., Sus. & Schuyl.	1,413,431	2.7	1,463,693	2.6
Total	52,429,378	100.0	56,015,088	100.0

The total increase was 3,585,710 tons, or 6.8%. All the companies show increases in tonnage. The largest proportional gains were made by the Reading and the New Jersey Central; the smallest by the Pennsylvania and the Delaware, Lackawanna & Western. The figures indicate that the total for 1905 will be over 60,000,000 tons.

Birmingham. Dec. 11.

The coal production in Alabama is strong, and every effort is being bent to keep up steady work at the mines. The railroads are meeting almost every demand for cars, and there is prompt delivery, everything considered. There will be considerable new work started on as soon as the new year sets in. The strike of the union miners in Alabama is still on, but very little mention is made of it in the local papers, and there are but few signs of its continuance except in the union mining camps themselves.

Directors of the Sloss-Sheffield Steel & Iron Co. from the East and from Richmond, Va., are in the Birmingham district, looking over the different properties of the company.

Chicago. Dec. 11.

There has been a general easing of the market for wholesale coal in the last week, due chiefly to weather conditions. The absence of severe weather throughout Chicago territory seems to be taken by many dealers and consumers of coal to indicate that the winter will be an open one, and that supplies need not be ordered until they actually are needed. Every cold wave of minor importance sends orders pouring into wholesalers' offices. This condition exists for both bituminous and anthracite and probably will not be changed for the winter.

Dock supplies of anthracite are about the same as last year, at the close of navigation, and probably are ample to provide for the needs of this territory, even with the worst fears of the prophets of scarcity of all-rail coal, because of car shortage, fulfilled. The car shortage, indeed, is not so much complained of as two or three weeks ago, and more coal has been coming in from the western fields, adding to the bearish tendency of the market.

Western coals are 10@20c. lower than last week, on steam grades, particularly run-of-mine. Present quotations are: Lump and egg, $2.50@$2.85; run-of-mine, $2@$2.25; screenings, $1.30@$1.60. The new railroad rule of only three days free time is causing greater activity in getting rid of coal to escape demurrage charges.

Smokeless coals are somewhat weaker, due to weather and railroad conditions. Supplies are better, but still said to be inadequate to the demand. Lump and egg are quoted at $4.15@$4.80; run-of-mine, $3.25@$3.55. Youghiogheny is selling at $3.40 for three-quarter coal, on the few sales made.

Hocking is in better supply, but the price is still somewhat high, $3.50@$3.75 Chicago. This is a decline of 10@15c. from last week's prices, with the probability that increased supplies will lower the market 10@15c. more.

In the anthracite trade chestnut is still in strongest demand and short supply, with no relief apparently in sight.

Cleveland. Dec. 12.

A few cargoes of coal are still going to the head of the lakes, but the railroads are not furnishing equipment for a very heavy movement. The figures will show at the end of the year that the movement has been exceedingly light all through.

There is a strong demand for steam coal in this territory, with the prices still mounting. The shortage of cars is one factor; the demand in other territories is another. The whole market is therefore strong. Run-of-mine steam coal is now selling at $1.50 a ton at the mines, with the supply short at that, and another advance impending. The demand for slack is heavy. Pittsburg slack is selling at $1 at the mines, while the middle district slack is selling all the way from $1.10 to $1.25 at the mines. The supply is short.

Domestic coal prices have been marked up again. The Massillon Association has put the price up to $2.25 at the mines for selected lump.

The coke market is stiff but steady. The prices hold about as they have been at $4 for the best grades of 72-hour coke for spot shipment and $3.90 on contract. Furnace coke is selling at $3 to $3.25 at the oven.

Pittsburg. Dec. 12.

Coal.—Not more than 50% of the railroad mines in the Pittsburg district have been in operation during the week, owing to the shortage of railroad cars. The last shipment to lake ports was made on Saturday, and it is believed more cars will be put in the coal traffic shortly. Demand is good, and prices remain firm on a basis of $1.30 a ton for run-of-mine at the mine. All the river mines are running and will be kept in steady operation, as many empty coal boats and barges were brought up the river on the rise last week. Considerable interest is taken here in the convention of anthracite miners which will open on Thursday at Shamokin. If an advance is demanded it will be an indication of what may be done at the convention of bituminous miners at Indianapolis next month.

Connellsville Coke.—There was an increase in production in the Connellsville field, but shipments fell off slightly. The price of furnace coke for prompt shipment is down to $2.85 a ton, but on contract for next year the price is firm at $3 a ton. Foundry coke remains at $3.50 a ton for prompt and future delivery. The total production of strictly Connellsville coke for the week was 280,405 tons, and the shipments aggregated 11,849 cars distributed as follows: To Pittsburg and river points, 4,285 cars; to points west of Pittsburg, 6,296 cars; to points east of Everson, 1,268 cars. The combined shipments from the Connellsville and Masontown fields amounted to 355,883 tons.

San Francisco. Dec. 7.

The market shows no material change in conditions or prices. Demand for domestic coal is a little better than it has been.

For coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wellsend and Brymbo, $7.50 per ton.

Foreign Coal Trade.

Dec. 13.

Imports of fuel into Germany for the 10 months ending Oct. 31 are reported as below, in metric tons:

	1904	1905	Changes.
Coal	5,904,602	7,846,945	I. 1,942,343
Brown coal	6,201,934	6,534,211	I. 332,377
Coke	430,571	589,739	I. 159,168
Total	12,537,107	14,970,895	I. 2,433,788

The increase this year was 19.4% in the totals. Exports for the 10 months were as follows:

	1904.	1905.	Changes.
Coal	14,641,994	14,738,444	I. 96,450
Brown coal	18,925	16,531	D. 2,394
Coke	2,259,926	2,267,623	I. 7,697
Total	16,920,845	17,022,598	D. 101,753

The increase in the total was 0.6%. The total exports this year exceeded the imports by 2,051,703 tons only. Included in these exports this year is 19,371 tons of coke to the United States.

The production of coal in the German Empire for the 10 months ending Oct. 31 is reported as follows, in metric tons:

	1904.	1905.	Changes.
Coal	99 277,487	99,951,160	I. 673,673
Brown Coal	39,670,010	42,438,507	I. 2,768,497
Total mined	138,947,497	142,389.667	I. 3,442,170
Coke made	10,166,354	12,366,680	I. 2,200,326
Briquettes made.	9,411,952	10,589,951	I. 1,177,999

The total increase in coal mined was 2.5%. The briquettes made are chiefly of brown coal, or lignite.

Imports of coal into Belgium for the 10 months ending Oct. 31 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	3,001,057	3,384,970	I. 383,913
Coke	276,818	297,472	I. 20,654
Briquettes	36,805	52,627	I. 15,822
Total	3,314,680	3,735,069	I. 420,389

The exports of fuel for the 10 months were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	4,201 273	3,904,990	D. 296,283
Coke	724,890	826,087	I. 101,197
Briquettes	452,177	405,146	D. 47,031
Total	5,378,340	5,136,223	D. 242,111

The exports were chiefly to France and Germany. The excess over the imports was 1,401,154 tons this year.

Iron Trade Review.

New York, Dec. 13.

The temporary lull in new buying continues, and most people in the trade are inclined to look for comparative quiet until after the close of the year. This is always in order in December, and makers will not be averse to a few weeks' rest from new work, which will give them a chance to catch up on their contracts.

Pig iron buying has been light, and confined chiefly to small orders. The cable reports some buying for American account in Great Britain; but it seems to have been really confined to speculative purchases of warrants, and no large imports are expected.

That future demand for finished material will be strong is shown by the letting of several large contracts for structural work, and by the placing of orders for some large vessels in the Lake shipyards. These ship orders are, in part, the result of the recent big storms, some of the new vessels being intended to replace those lost.

Ore buying for next season has been pretty well concluded. Most of the furnaces which buy Lake ore, and do not control any mines, have closed their contracts for the coming season. Prices at Lake Erie ports are 50c. per ton higher all around than those of the season just closed.

Birmingham. Dec. 11.

While the pig-iron market is not as active right now in Alabama, as it has been at times this year, there is much strength still shown. The furnace companies appear to be satisfied with conditions, and every attention is being given to the production and prompt delivery of the product. The severe weather has not yet set in, and there is no disturbance at the outdoor work, such as that in ore mines and limestone quarries. The raw material supplies are holding up well. The railroads are doing well in the way of prompt handling of the products. The many employees of the furnace companies and the railroads are not going to have an extensive holiday season this year.

Some few sales have been made recently in this district for delivery into the second quarter of next year. It is given out that the probable make for the first three months in 1906 has been covered.

The following quotations are given: No. 1 foundry, $15; No. 2 foundry, $14.50; No. 3 foundry, $13.50; No. 4 foundry, $13; gray forge, $12; No. 1 soft, $15; No. 2 soft, $14.50.

There is no change in the steel situation, the production being lively and the demand strong. Announcement has been made of the organization of the Southern Steel Co., capital stock, $16,000,000. A merger has been brought about of the Alabama Steel & Wire Co. and the Underwood Coal Co. The concerns own coal mines, coke-ovens, steel plant, blast-iron furnaces, steel-rod, wire and nail mills and other works in the Birmingham and Gadsden districts.

Chicago. Dec. 11.

The last week has seen a fair business in pig iron, considering that December is normally a period of quiet. There has been no revival of heavy buying, and no such change is looked for until the new year is well under way. Malleable iron is in active demand, and inquiries for it are numerous, causing agents to predict that sales of malleable will be especially good in January. Foundry-iron requirements for the first half of the year are not all covered, but smelters are reluctant to order for these requirements, or for the last half of the year. A period of waiting, with orders for small lots to cover emergencies, seems to be in prospect for the rest of December.

Prices remain as quoted last week: $19.50@$20 for Northern No. 2; $14.50@$15 Birmingham, or $18.15@$18.65 Chicago, for Southern; and $19.50@$20 for Lake Superior charcoal. With the falling off of the strong demand for both Northern and Southern iron, the lower figures express ruling sales. Most of the sales of the week have been for deliveries in the second quarter of 1906, with some sales running into the third quarter.

Finished products, especially railroad supplies, continue in active demand, though not selling so largely as a month ago.

Coke continues in good supply with Connellsville a little weaker in price—$3.25@$3.50 ovens for 72-hour, or $5.90@$6.15 Chicago.

Cleveland. Dec. 12.

Iron Ore.—The announcement is made that 96% of the ore to be shipped during 1906 has already been sold. The estimate made by the head of the Ore Association is that the capacity of the Lake Superior mines will not permit an output of over 1,000,000 tons in excess of the present year's production. This will limit the production to about 35,000,000 tons for 1906. The merchant furnaces will sell between 35 and 40% of this ore, according to estimates. Prices prevailing have been 50c. a ton above last year's figures, being $4.25 for bessemer Old Range, $4 for bessemer Mesabi; $3.70 for non-bessemer Old Range and $3.45 for non-bessemer Mesabi. Shipments for the year have stopped, the last mine in the Lake Superior district closing on Saturday last.

Pig Iron.—The market is dull for the time being. Spot iron in this territory is all sold for this year and buying for first half is not active at present. It is estimated that the amount available for sale yet for that delivery is not large. The ruling price is $18 for No. 2 in the

Valleys. Southern furnaces are selling about all of the ore in this territory that is being sold for spot shipment. They are getting $14.50 Birmingham for No. 2. Steel-making irons are dull, the furnaces being oversold. The ruling price is $18 in the Valley for basic bessemer and malleable.

Finished Material.—The Steel Corporation ordered two new boats last week, each to be 600 ft. in length, and the Cambria Steel Co. gave a duplicate order. This, with other boat orders in contemplation, indicates a good demand for structural and plates. This demand will run through the first nine months of next year. Ship orders in sight promise a demand for a year. Billets are not to be had for love or money. Bessemer buyers are willing to pay $30@$32 for their steel, but are not able to get any. Forging billets run about $35 at the mill. Bars are in demand from car-builders and agricultural implement works. Sheets are steady, with prices unchanged. Bar iron is strong at 1.75 to 1.80c. at the mill.

New York. Dec. 13.

A large business is still coming forward in pig iron though an increasing proportion of it is in small lots, indicating that the large consumers are generally supplied. In steel there is much work coming in, including several large building contracts. The contract for the 22,000 tons of steel required in the construction of the second section of the Pennsylvania depot at New York has been placed with Milliken Bros., of this city.

Pig iron prices show little change, but there is a tendency to the higher ranges. For Northern iron, in large lots, we quotes No. 1X, $19@$19.25; No. 2X, $18.25 @$18.75; No. 2 plain, $17.75@$18.25; gray forge, $16.50@$17; Virginia foundry is held at $18.60@$19.10 for No. 1, and $18.10@$18.60 for No. 2. Basic has been $18.25@$18.75 for Alabama, and 25c. less for Northern. For Southern iron, on dock, quotations are: No. 1 foundry, $18.75; No. 2, $18.25; No. 3, $17.50; No. 4, $17; No. 1 soft, $18.75; No. 2 soft, $18.25; gray forge, $16.50. Southern prices are firm, and a little extra is asked for special deliveries.

Cast-Iron Pipe.—Prices are steady on a basis of $28.75 per net ton for 6-in. pipe, carload lots at tidewater points. All the foundries are full of work.

Bars.—Business is good and prices still firm. Iron bars are 1.795c., tidewater, for plain, and 1.895c. for refined. Steel bars are 1.745c., tidewater. Store trade is good, with 2.25@2.50c. the current price, but premiums are asked on special deliveries.

Plates.—Steel plates are still in strong demand. Tank plates are 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745c. up, according to width. For early delivery premiums are asked; in fact, nearly all business is on a premium basis.

Structural Material.—Orders continue to come in, and deliveries are uncertain. Prices are nominally unchanged. Beams under 15-in. are 1.845c. for large lots; over 15-in., 1.895c.; angles and channels, 1.845c., tidewater delivery. Premiums are asked on most ordinary business. Some large contracts are noted above.

Steel Rails.—No change in standard sections. Light rails are in demand, prices ranging from $26 for 35-lb., up to $33 for 12-lb. rails.

Old Material.—Demand is less active, but prices are firm. No. 1 railroad wrought is $22@$23; No. 1 yard wrought, $21@ $22; machinery cast, $14@$15; heavy steel melting scrap, $18@$18.50. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. Dec. 13.

Pig Iron.—Careful inquiry develops the fact that there is considerable iron still wanted for delivery during the next sixty days. Quite a number of inquiries have gone out within the past week from users of iron in eastern and middle Pennsylvania, and most of them are now in the hands of the makers of Southern iron. Our Pennsylvania people are either unable or not disposed to compete for this new business. Prices have not changed in point of fact, although some asking prices would make it appear that a natural advance had been made within a week. There is call for low phosphorus, but no sales have been heard of. Quotations for No. 1X foundry are $19.50; No. 2X, $18.50 to $19; No. 2 plain, $18; gray forge, $16.50; basic, $18; low phosphorus, $24.25.

Steel Billets.—Billets have been sold at $30 for open-hearth.

Muck Bars.—The price for muck-bars to-day is $29 at mill, and some business has been placed at that figure.

Bars.—A slight improvement is reported at some of the interior mills of this State, on a basis of 1.89½ at tidewater. The stores of the city and country report an excellent demand.

Sheets.—The sheet market is active in retail lots, but no business of moment can be traced up in large lots.

Plates.—The plate mills are so overcrowded that it is impossible to make any satisfactory arrangements with large buyers who are endeavoring to make arrangements for deliveries of steel plate during the winter. There are negotiations on hand just now for steel for car building, which will likely be taken care of, provided the buyers will be sufficiently accommodating in naming the dates.

Structural Material.—A report of this branch of the industry would virtually be a repetition of what has been said for several weeks past. The substantial point of the situation is that the American Bridge Co. has its hands full of work to be placed, but will probably be able to secure sufficient material when it needs it.

Old Material.—Dealers are scouring the country for certain kinds of scrap, which can only be had at top prices. No. 1 steel scrap is in very active request at $18, and railroad scrap cannot be had at any price, as the output is all contracted for. No. 1 yard scrap is held as high as $21; machinery scrap is offered at $16.50; old iron rails are nominally $25 per ton.

Pittsburg. Dec. 12.

There were no sales of any consequence of pig iron or finished steel products during the week and buying for this year seems to be over. The most important transaction was the sale of 2,000 tons of bessemer pig iron for early delivery at $17.50, Valley furnaces. The price for bessemer and basic iron for first quarter on contracts made so far is $17, Valley, and the bulk of the production has been taken at that figure. It is understood, however, that after the first of the year the minimum rate will be $18. It was stated today that the United States Steel Corporation has practically concluded negotiations with the Bessemer Pig Iron Association and a large independent interest for its requirements of outside iron for the first quarter. The tonnage to be bought has not been definitely decided upon, but will not be less than 150,000 tons. The price will be $17, Valley. There are a few inquiries for bessemer for first quarter in 1,000- and 2,000-ton lots, and the furnaces are asking $17.50, Valley. If these sales are not made before the Corporation closes its deal the price will likely be advanced 50c. a ton. A few sales of small lots of foundry No. 2 have been made for prompt delivery at the highest price of the year, $18, Valley furnace. Gray forge is higher, one contract for second-quarter delivery having been closed at $17.10, Pittsburg. Ferro-manganese continues scarce, and the price for prompt shipment is almost any figure that is named. Some sales for second quarter are reported at $85 a ton, but the strike clause is in the contracts and there is no importance attached to the transactions. The mills in this district are not crippled so far, on account of the scarcity of ferro.

The practical cessation of buying of finished steel products will not affect the operation of the steel mills, as all are still behind in deliveries and are running to capacity. It is announced today that the holiday shut-down of the mills will be for Christmas and New Year's Day only. Some plants may close on Saturday night and not resume until Tuesday morning. The scarcity of steel is keeping a number of mills of the American Sheet & Tin-Plate Co. idle. A few weeks ago it was operating 70% of its tin-plate and 80% of

its sheet mills, and since then several plants were started but did not run long. The strike against the American Bridge Co. by the International Association of Bridge & Structural Iron Workers has become serious. While the company has been booking heavy orders for structural material, it is not insisting on prompt shipment, and this may benefit the sheet and tin-plate interest, as the steel can be used in other lines. The strike is a peculiar one. The workers' union demanded that the company not only employ members of the organization exclusively, but that it insist upon sub-contractors employing union men. The general strike started in September and the following month the American Bridge Co. conceded all the demands of the organization. Instead of declaring the strike off and ordering its men to return to work, the association made an additional demand and insists that all structural work being done by the United States Steel Corporation be by members of the union. This affects the National Tube Co., a subsidiary interest, which is erecting a big plant at McKeesport, and also other underlying concerns of the Steel Corporation. It was reported that Post & McCord, of New York, were doing some work for the bridge interest and the association immediately extended the strike to this firm. Unless this trouble is settled soon, the structural mills will not be crowded, and a large tonnage of steel may be diverted to other channels. The mills never had so large a tonnage of structural material on the books. The American Bridge Co. alone, it is reported, has contracts calling for fully 500,000 tons. The independent interests are well filled with orders and are taking advantage of the strike of the bridge and structural iron workers against the American Co. by employing all of the strikers in this district.

Despite the fact that the orders for merchant steel bars are unprecedented and that mills are behind in deliveries, no advance in prices has been ordered and the difference in price between steel and iron bars is from $8 to $10 a ton. The outlook for bars is unusual and the Carnegie Steel Co. is preparing for a heavy demand next year. It has just decided to add a 10-in. mill to the Clairton works, which will be ready for operation about next May. This is the third mill to be added to the Clairton plant since the property was acquired by the United States Steel Corporation. One is a structural mill which was put in operation in September.

Pig Iron.—The only important sale of the week was 2,500 tons of bessemer pig iron at $17.50, Valley furnace, for delivery this year. Two lots of foundry No. 2 of 250 tons each sold at $18, Valley.

Steel.—There is no change in the steel market. Bessemer and open-hearth billets are quoted nominally at $26@$27. Merchant steel bars remain at 1.50c. and plates at 1.60c.

Sheets.—The mills are suffering from a shortage of steel, and production has been curtailed. Black sheets are firm at 2.30@2.35c., and galvanized at 3.35c. for No. 28 gauge.

Ferro-Manganese.—The famine continues and almost any price could be obtained. Ferro may be quoted nominally at $125 a ton.

Cartagena, Spain. Nov. 25.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that shipments for the week were one cargo, 3,400 tons dry ore, and one cargo, 4,550 tons manganiferous ore, to Great Britain. Demand continues very strong, and most producers are sold ahead into the second half of next year. Tonnage is scarce; prompt boats are hard to get and rates are stiff.

Quotations for iron ores show little change. Ordinary 50% ore is 7s. 8d.@8s.; special low phosphorus, 8s. 2d.@8s. 6d.; specular ore, 58% iron, 11s.; S. P. Campanil, 9s. 6d. per ton. All prices are f. o. b. shipping port. Manganiferous ores, same terms, range from 10s. 8d. for 35% iron and 12% manganese, up to 17s. 3d. for 20% iron and 20% manganese.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s. per ton.

Heavy Chemicals and Minerals.

NEW YORK, Dec. 13.

In continuance of the general tone of the year, the demand for heavy chemicals is characterized by strength, and steady prices, though in some instances the market seems to be a waiting one, apparently delaying action till after the new year.

Sulphur.—This shows no change from our last report. With prices practically the same, the market is a little slow and dull. We give herewith the prices for the American product, noting that the ports of New York, Boston and Portland are in one class, and Philadelphia and Baltimore in another. The domestic shipments are mostly by water. Sicilian is quoted the same for Atlantic ports as the Louisiana product.

Pyrite.—This continues unchanged and in steady demand, the production being constantly absorbed (mostly for acid used by the fertilizer makers), and with some difficulty in making the supply equal to the active demand. Most of the foreign supply comes from Spain, with a very considerable fraction from Pilley's Island, Newfoundland. Pyrite cannot be used to advantage in making "sulphite pulp" for paper, sulphur being employed for this purpose.

Nitrate of Soda.—This shows the same prices, with a market which is reported as quiet but firm. Freights are the same. The present status will probably not change till after the first of the year.

Salt Cake.—This is quoted at 65c. per 100 lb. on contract for carload lots. The *heavy alkalies* (carbonates and caustic) show a sustained demand.

Sulphate of Copper.—This reported recently a slight advance (5c. per 100 lb.), probably in sympathy both with the noted advance of the metal, and with the general market demand. The price is given herewith.

Tin Crystals.—These are quoted at 21c. —1c. below last month. *Tin bichloride* is reported at 10¼c., a slight advance (¼c.) over last month.

Phosphates.—Phosphate companies report the same situation, as noted hitherto and recently. It is just about a "stand off" between buyer and seller. Actual prices are the same as those last quoted, and the market is firm. We discontinue, for the present, quotations on foreign supplies (Algerian, Tunis, Christmas Isle, Ocean Isle, Somme, etc.), as the firms handling these report no importations, the demand being met by the domestic supply.

Acids.		
Boric, crystals	per lb.	.10
powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.03
48%	"	.05
60%	"	.11
Nitric acid, 36°, 100 lb		$4.75
38°, 100 lb		5.25
40°, 100 lb		5.50
42°, 100 lb		5.75
Oxalic acid, com'l, 100 lb		$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton		13.50@14.50
60°, 100 lb. in carboys		1.05
60°, bulk, ton		18.00@20.00
66°, 100 lb. in carboys		1.20
66°, bulk, ton		21.00@23.00
Blue Stone (Copper Sulphate), car-load lots, per 100 lb		$5.55
Nitrate of Soda, 100 lb. 96%		2.25
" " " 95%		2.22½
Sulphate of Ammonia, per 100 lb		3.10@ 3.15

Phosphates.	F. o. b.	C. I. F. Gt. Britain. or Europe
Sulphur.		
Louisiana, New York, Boston or Portland	ton	$22.25
Philadelphia or Baltimore	"	22.75
Pyrite.		
Domestic, furnace size	Unit	11c.
Fines	"	10c.
Imported, lump, At. ports	"	10@11c.
" fines " "	"	9½@10c.
" furnace size	"	11½@12c.

Pyrite prices are per unit of sulphur. On lump deliveries, a charge of 25c. per ton is made for breaking to furnace size.

*Fla., hard rock	$7.75@8.00	$10.90@12.10
land pebble	4.00@4.25	7.95@ 8.65
†Tenn., 78@80%	4.60@4.65	10.52@10.92
78%	4.00@4.25	.....
75%	3.65@3.75	.....
68@72%	3.25@3.50	.....
‡So. Car. land rock	4.00@4.25	.....
river rock	3.75@4.00	.....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

British Chemical Trade.—Exports of chemicals from Great Britain for the 10 months ending Oct. 31 are reported as follows, in cwt. of 112 pounds:

	1904.	1905.	Changes.
Copper sulphate	66,950	54,349	D. 12,601
Sulphuric acid	100,223	70,836	D. 29,387
Muriate of ammonia	64,253	79,866	I. 15,613
Bleaching materials	654,129	749,649	I. 95,520
Soda ash	1,061,320	1,233,663	I. 172,343
Bicarb. soda	267,797	363,569	I. 95,772
Caustic soda	1,106,898	1,246,373	I. 139,475
Soda crystals	179,880	162,875	D. 17,005
Soda sulphate	750,294	620,401	D. 129,893

Imports of chemicals into Great Britain for the 10 months ending Oct. 31 were as follows, in hundredweight:

	1904.	1905.	Changes.
Borax and borates	305,954	194,848	D. 111,104
Potash nitrate	240,414	154,480	D. 185,937
Soda compound	254,282	299,379	I. 45,098
Bleach	199,526	187,258	D. 12,268

Imports of sulphur in 1905 amounted to 341,334 cwt., as compared with 309,535 cwt. the first 10 months in 1904; an increase of 31,799 cwt. Imports of iron and copper pyrites (invoiced chiefly for their sulphur value) were 579,022 tons in 1905, as compared with 610,766 tons for a similar period last year; a decrease of 31,744 tons.

Metal Market.

New York, Dec. 13.

Gold and Silver Exports and Imports.

At all United States Ports in Oct. and Year.

Metal.	October.		Year.	
Gold	1904.	1905.	1904.	1905.
Exp	$3,855,649	$305,124	$86,895,557	$43,983,045
Imp	8,045,275	10,928,379	76,739,945	41,266,481
Exc	I. $4 189,626	I. $10,633,255	E. $10,155,612	E. $1,716,564
Silv.				
Exp	3,485,098	4,503,726	42,615,018	43,951,936
Imp	1,717,114	2,089,358	21,894,345	26,596,356
Exc	E. $1,767,984	E. $2,419,368	E. $21,220,673	$17,355,580

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending December 9, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$16,500	$124,939	$1,037,455	$163,141
1905	34,619,503	10,689,671	32,859,937	4,092,467
1904	100,900,489	6,599,623	33,727,810	1,132,615
1903	31,812,827	16,441,443	30,783,825	3,265,454

Imports, both gold and silver, for the week were from the West Indies, Mexico and Central America. Exports of gold for the week were to the West Indies; of silver chiefly to London.

The statement of the New York banks —including all the banks represented in the Clearing House—for the week ending Dec. 9 gives the following totals, comparison being made with the corresponding week of 1904.

	1904.	1905.
Loans and discounts	$1,082,089,400	$1,016,320,800
Deposits	1,118,040,000	992,235,700
Circulation	42,534,100	53,268,700
Specie	211,965,100	173,526,300
Legal tenders	76,910,100	73,286,100
Total reserve	$288,875,200	$246,812,400
Legal requirements	279,510,000	248,058,925
Surplus	$9,365,200	
Deficit		$1,246,525

Changes for the week this year were decreases of $7,561,400 in loans, $14,936,800 in deposits, $797,800 in circulation, $6,317,100 in specie and $1,229,000 in legal tenders. For the second time within a month there was a deficiency in the legal reserve, notwithstanding the contraction in loans and discounts.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars.

	Gold.	Silver.
New York Associated	$173,526,300	
England	167,553,415	
France	577,775,150	$217,698,695
Germany	158,055,000	52,685,000
Spain	75,015,000	114,335,000
Netherland	33,015,015	30,227,000
Belgium	16,050,000	8,025,000
Italy	130,225,000	15,741,000
Russia	574,625,000	18,820,000
Austria	224,505,000	60,405,000

The returns of the Associated Banks of New York are of date Dec. 9, and the others Dec. 8. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York.

Shipments of silver from London to the East for the year up to Nov. 30 are as follows:

	1904.	1905.	Changes.
India	£8,901,368	£5,948,321	D. £2,953,047
China	424,723	779,113	I. 354,390
Straits	79,268	38,299	D. 40,969
Totals	£9,405,359	£6,765,733	D. £2,639,626

Receipts for the week were £10,500 from the West Indies and £246,100 from New York; a total of £256,600. The exports were £1,250 to Egypt, £253,600 to India, and £64,860 to China; £319,710 in all.

Indian exchange is firm, and the Council bills offered in London were all taken at 16.03d. per rupee. Much silver is going to India, and there has been also some gold shipped from Australia to that country.

The amount and kind of money in the United States on Dec. 1 is as follows:

	In Treasury.	In Circulation.
Gold Coin (including bullion in Treasury)	$236,716,191	$649,040,390
Gold Certificates	48,866,620	477,154,249
Silver Dollars	689,637	83,326,228
Silver Certificates	4,770,752	470,964,248
Subsidiary Silver	7,609,174	108,776,379
Treasury Notes of 1890	42,278	8,445,7 :
United States Notes	3,484,466	343,196,550
Currency Certificates		
National Bank Notes	12,088,485	521,240,773
Total	$314,267,603	$2,662 134,539

Population of the United States Dec. 1, 1905, estimated at 83,843,000; circulation per capita, $31.75. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasurer of the United States, amounting to $55,470,590.49.

The total amount in circulation shows an income of $9,002,960 over Nov. 1; and of $288,246,172 over Dec. 1 of last year.

The silver market has recovered this week from recent reaction on urgent demand in London for spot silver, and closes firm at the advance.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.50	$0.51
Peruvian soles and Chilean pesos	.46	.47
Victoria sovereigns	4.85½	4.87½
Twenty francs	3.86	3.88
Spanish 25 pesetas	4.78	4.82

SILVER AND STERLING EXCHANGE.

Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
7	4.8510	63⅛	29 7/16	11	4.85	64¾	29 15/16
8	4.84⅞	63⅛	29 7/16	12	4.85⅛	65⅛	30⅛
9	4.85	64⅛	29 11/16	13	4.85¾	65¼	30⅜

New York quotations are for fine silver per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals.

Daily Prices of Metals in New York.

December.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
7	17¾ @18¼	17¾ @18¼	78⅛	35½	5.35	6.45 @6.50	6.30 @6.35
8	18 @18¼	18 @18¼	78¼	35½	5.35	6.45 @6.50	6.30 @6.35
9	18 @18¼	18 @18¼	....	35½	5.35	6.45 @6.50	6.30 @6.35
11	18¼ @18½	18⅛ @18½	79¾	35¾	5.35	6.45 @6.50	6.30 @6.35
12	18½ @18¾	18¾ @18⅝	80	35¾	5.35	6.45 @6.50	6.30 @6.35
13	18⅛ @18¾	18⅛ @18¾	80⅛	36	5.35	6.45 @6.50	6.30 @6.35

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic.

Copper.—The market continued quiet throughout last week, but with the opening of this week there came an outburst of activity, owing to heavy inquiries for both home trade and export, which carried the market up by leaps and bounds. In fact, the conditions are so unsettled, on account of the scarcity of near-by supplies, that it is very difficult to gauge the exact prices at which business is taking place from day to day. Fancy figures are being talked about for small lots available on the spot, while, on the other hand, more distant futures can be bought at prices considerably less. The close is very strong at 18½@18¾ for Lake copper; 18½@18¾ for electrolytic in ingots, cakes and wirebars.

Owing to the scarcity of all kinds of copper, casting for early delivery has moved very much nearer the price of refined grades, the range being 17⅞@18½, depending upon brands and deliveries.

The standard market in London also shows a great deal of strength, and with only slight intermediate reactions closes £80 2s. 6d. for spot, £79 10s. for three months.

Refined and manufactured sorts we quote: English tough, £80 15s.; best selected, £82; strong sheets, £90; India sheets, £85; yellow metal, 8¼d.

Exports of copper from New York for the week were 2,321 long tons. There were no exports reported from Baltimore.

Tin.—The consumption of tin is so large that buyers, in spite of themselves, are forced to come into the market at the high prices ruling, which, however, are justified by the sound statistical position of the metal. The closing is very much higher at 35¾@36, depending upon deliveries.

The market in London has also advanced, and closes firm at £164 2s. 6d. for spot, £162 15s. for three months.

Lead.—The American Smelting & Refining Co. is billing its current shipments at 5.35c. New York, 5.27½c. St. Louis.

A shortage of near-by supplies is reported in Europe, and the London market on this account has advanced to £17 6s. 3d. for Spanish lead, £17 8s. 9d. for English lead.

The movement of foreign lead in the United States for the 10 months ending Oct. 31 is reported by the Bureau of Statistics as below; the figures are in short tons:

Lead in bond, Jan. 1st	1,481
Imports, 10 months	3,562
Total stock	5,043
Re-exports, 10 months	2,112
In bond, Oct. 31	8,340
Total accounted for	60,452
Balance	34,591

The balance is, approximately, the quantity of foreign lead consumed in this country during the 10 months. The statement does not take account of the 10% allowance to smelters and refiners for loss and waste.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is strong and higher. The latest sales are on a basis of 5.75c. for Missouri brands.

Spanish Lead Market.—Messrs. Barrington & Holt write from Cartagena, Spain, under date of Nov. 25, that silver has been 14.75 reales per ounce. Exchange is 32.11 pesetas to £1. Local price for pig lead has been 82.25 reales per quintal; equal, on current exchange, to £14 6s. 7d. per long ton, f. o. b. Cartagena. Shipments were 300 tons to Liverpool and 101 tons to Swansea, all desilverized lead; 246 tons argentiferous and 130 tons desilverized lead to Marseilles.

Spelter.—There is a steady demand, which is sustaining the market, galvanizers and brass manufacturers being exceedingly busy. The close is firm at 6.45@6.50c. New York, 6.30@6.35c. St. Louis. The London market, after declining to £28 10s., closes firm at £28 15s. for good ordinaries, £29 for specials.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is active and largely higher. Latest sales are on a basis of 6.35c. East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Nov. 25, that prices are nominally unchanged at 95. fr. for blende, 35% zinc, and 72 fr. for calamine, 30% zinc. Mining is active. Shipments were 900 tons blende and 1,400 tons calamine to Antwerp; 1,900 tons blende to Stettin.

Silesian Spelter Market.—Paul Speier reports from Breslau that the market shows only unimportant fluctuations, its firm tendency remaining uninterrupted. Good, ordinary grades sell for 28@28.25 marks for 50 kg., according to amount and terms of order, and special grade for 28.50@28.75 marks, f. o. b. Breslau. These are equivalent, respectively, to 6.08@6.11c. and 6.17@6.22c. per pound.

Zinc sheet and zinc dust show no change in quotations from last month.

Germany's foreign trade in zinc during the first 10 months of 1904 and 1905 has been in metric tons:

	Imports.		Exports.	
	1904.	1905.	1904.	1905.
Spelter	19,385	23,129	52,121	52,680
Zinc sheet	133	488	13,747	15,297
Zinc scrap	1,645	2,228	3,476	4,367
Zinc ore	77,211	101,195	33,685	33,260
Zinc white, etc.	4,575	6,332	15,073	16,075

Spelter exports were about stationary, but the imports show a considerable increase this year.

Zinc Sheets.—The price of sheet zinc is $7.75 per 100 lb. (less discount of 8%), f. o. b. cars Lasalle and Peru, in 600-lb. casks, for gauges No. 9 to 22, both inclusive, widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since January 1, 1905, have been as follows: December 30, 1904, $7.25; January 7, 1905, $7.50; May 12, $7.25; June 1, $7; July 29, $7.25; August 10, $7.50; December 1, $7.75. The demand is reported active.

Antimony.—There is a good demand for this metal, and prices are firm at the last quotations, viz., 12½@13½c., depending upon brands and deliveries.

Nickel.—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48 up to 60c., also according to size of order and deliveries.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated wire, 90c.; and cones, $1 per gram.

Imports of platinum into the United States for the 10 months ending Oct. 31 were 5,947 lb. in 1904, and 5,937 lb. in 1905; a decrease of 10 lb. this year.

Quicksilver.—Prices in New York continue steady at $40 per flask for large orders—over 100 flasks—and $40.50 for jobbers' lots, down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $41.75@$42.25 per flask. San Francisco prices are steady at $39 for domestic orders, and $37.50 for export. The London price is £7 5s., but second hands ask only £7 2s. 6d. per flask.

Manganese Alloys.—Prices for these alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 50 kg. delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese copper, No. 1, 30% Mn	275
No. 2, 28% Mn	189
No. 3, 20 to 25%, with 2 to 4% iron	165
Manganese tin, No. 1, 55% Mn., no iron	480
No. 2, 56% Mn., some iron	280
Manganese nickel, No. 1, free from iron	450
No. 2, traces of iron	270

Manganese metal is quoted as 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen. These alloys are made by the Isabellenhütte, in Bonn, Germany, which is represented by Mr. Speier in Breslau as selling agent.

Minor Metals.—For minor metals and their alloys, wholesale prices are f. o. b. works:

	Per lb.
Aluminum.	
No. 1, 90% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled sheets	4c. up.
Aluminum-bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Cadmium, f. o. b. Hamburg	77c.
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	95c
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro Chrom. (75%)	12½c.
Ferro-Tungsten (37%)	29c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@98% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$1.75
Tantalic acid (N. Y.)	40c.
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best), pound lots	90c.

Variations in prices depend chiefly upon the size and condition of orders.

Missouri Ore Market.

JOPLIN, Dec. 9.

The highest prices paid for zinc ore was $55 per ton, an advance of $1 over the price of last week. Lower grade ores did not fare so well, the price on some bins being pushed downward $1 per ton. This peculiar condition of the market seems to be the result of the withdrawal of the Prime Western Spelter Co., the United Zinc & Chemical Co. and the Lanyon Zinc

Co. from the market; they were all large buyers of medium-grade ores, which has given the buyers of under grades an opportunity to make a wider selection and enabled them to make sharper trades for ore bearing an excess of iron and lead. This presents a market with an assay basis ranging from $47 to $52 per ton of 60% zinc. In other words, the buyers are offering any basis they think will buy the ore. The same competition remains in the field for the higher grades, and this demand keeps up the price for this grade of ore.

There seems no prospect of a let-up in the advancing price of lead, which was sent up another $2 per ton this week, to $77 for the best and $76 for 80% grades. Competition is very sharp and buyers are taking all the ore they can get.

The average price of zinc ore for the work was $44.90; of lead ore, $75.63 per ton.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City..	2,694,020	823,980	$93,270
Joplin	2,044,930	226,640	58,700
Galena-Empire	816,740	99,200	22,560
Duenweg	739,240	93,690	20,560
Aurora	840,080	43,130	17,930
Granby	876,000	24,000	14,860
Badger	343,120	.....	8,230
Alba	296,250	.....	7,550
Neck City	235,850	.....	6,010
Prosperity	96,970	62,310	4,6[illegible]0
Oronogo	158,100	12,680	4,290
Carthage	126,050	.....	3,220
Spurgeon	168,790	2,540	3,030
Baxter Springs	22,270	50,160	2,400
Zincite	92,880	.....	2,340
Scott City	88,010	.....	2,110
Beef Branch	73,280	29,360	1,830
Sarcoxie	65,610	.....	1,570
Totals	9,779,190	1,467,690	$275,060
49 weeks	477,142,430	59,412,110	$12,531,170
Zinc value, the week, $219,550; 49 weeks,			$10,715,065
Lead value, the week, 55,510; 49 weeks,			1,816,105

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1904.	1905.	Month.	1904.	1905.
Jan.	33.33	52.00	Jan.	55.55	61 50
Feb.	33.63	52.77	Feb.	56.37	57.62
March	35.40	47.40	March	57.20	57.20
April.	35.75	42.88	April.	58.00	58.00
May	34.87	43.31	May	57.77	58.27
June.	32.93	40.75	June.	56.60	57.80
July.	33.37	43.00	July.	53.00	58.00
August	37.55	48.83	August	53.00	58.00
September.	40.18	46.75	September.	53.50	63.50
October	43.65	47.60	October	53.50	63.86
November.	43.95	49.55	November.	54.70	68.67

Wisconsin Ore Market.

PLATTEVILL, Dec. 9.

No noticeable lessening has occurred in the demand for zinc and lead ore, in fact during the last few days of the week there was a slight increase in activity among the buyers. The demand for znc ore exceeds the supply, and the conditions for steady high prices are favorable. Enterprise ore brought top price, $54 per ton of 60% zinc.

Lead continues firm, $32@$32.50 per 1,000 lb. for 75% grade. The Fairplay ore brought $35 a thousand.

The various camps of the Platteville district report the amount of ore loaded as follows:

	Zinc, lb.	Lead, lb.	Sulphur.
Platteville	564,200	68,220	.....
Shullsburg	83,000	34,700	.....
Mineral Point	35 000	.....	.....
Cuba City	263,190	58,780	.....
Benton	890.200	79,200	.....
Buncombe	957,550	.....	.....
Rewey	57,000	.....	.....
Livingston	169,000	54,500	.....
Monfort	.....	.....	296,000
Lenden	156,000	.....	42,000
Total	3,174,940	295,400	338,000

The railroads were able to supply sufficient cars for the loading of all the ore the producers were able to haul, cutting the supply in the bins down to the minimum. Platteville being particularly favored in having two roads, is loading the ore as fast as produced.

Mining Stocks.

New York. Dec. 13.

Speculation has been strong in the face of the high rates for money which still prevail. The special activity this week has been in the copper stocks, both on the exchange and on the outside market. Amalgamated Copper rose to $98. On the curb, Granby sold at $10; Nevada Consolidated at $10½; Utah Copper at $35; United Copper at $54½ for the common, and $84¼ for the preferred. United was in special demand.

On the Consolidated Exchange there were about the usual dealings in the Comstocks, but no special demand.

In the industrials, United States Steel closes at $38¾, with $105½ for the preferred. Tennessee Coal, Iron & Railroad has been at a high point, and closed at $143¾. Current report is that the Gates party has secured a controlling interest in this company, and that the consolidation with the Republic Iron & Steel will go through. American Smelting & Refining made a new record, closing at $160 for the common, and $133¼ for the preferred. This stock has been a favorite deal for some weeks.

Boston. Dec. 12.

The speculative fever is still on in mining shares, but the Utah and so-called Bisbee or Arizona properties lead in popular favor. The latter are not listed on the Stock Exchange, but are actively traded in on the curb. Outside of Copper Range the Lake mining shares have been neglected, with few exceptions, and as a result a lower range of values is seen for most of them. The most conspicuous stock the past week has been United Copper common, which has risen $21.75 in a week's time to $58. Trading in it has been on an enormous scale, but it is considered largely of a manipulative nature. The orders emanated principally from New York. North Butte is up $9.75 to $85.75 on large trading, and Copper Range rose $4.75 to $83.75, reacting to $81.25 tonight. The Baltic, which is practically all owned by Copper Range, has declared a dividend of $7.50 per share, making $12.50 for the year.

Boston Consolidated rose $5 to $27, closing $1.62½ below this. Director and Treasurer Schirmer has gone to London to attend the annual meeting. Control of the company is said to be held by the present management, notwithstanding rumors to the contrary. Nevada Consolidated, which has been a curb favorite, was listed on the Stock Exchange today and celebrated the event by a $2 rise to $12.75. There are 1,300,000 shares, par $5, of which 960,000 shares are issued and listed. Of the balance, 40,000 shares will be issued to complete the plant; 100,000 are reserved for extension, and 200,000 shares will be used to convert railway bonds. The $8 advance in the week of Amalgamated to $98.75 is considered significant and brings expectation of a $1.50 quarterly and 50c. extra dividend, putting the stock back to an 8% basis.

Parrot made a $4.25 advance to $33.50, but closes tonight at $31. No reason is assigned, except that it is looked to follow Anaconda, which has had a sharp rise. The latter touched $47.50 today, par being $25. Michigan sold up $1.25 to $18.25, but lost it, and Bingham rose $2 to $36.75. Calumet & Hecla is also up $25 to $705 per share, and Greene Copper $1.62½ to $29.37½. Mohawk is off $1 to $63, and Osceola $3 to $109. Utah, after stiffening $1 to $58, reached to $56.25. There has been considerable pressure in this stock. United States is off $1 to $39.50, being neglected, and Tamarack fell $3, to $124.

Dominion Iron advanced $4 to $24. East Butte, which is in process of being underwritten, is expected to be a favorite. Keweenaw, in which Cole, of North Butte, and Ryan have become interested, touched $23.50 on the curb, but is off from this now. Shawmut Consolidated, a Bingham proposition, is the latest favorite on the curb, touching $4.25 today. The St. Mary's Mineral Land Co. announces its third $1 dividend this year, which compares with $1 last year.

Colorado Springs. Dec. 8.

Trading was unusually light on the mining exchange, and there was little variation in prices.

There have been rumors of fight for control in the Acacia Co., and this may account for a slight advance in this stock; it sold today for 11¼c. Elkton sold for 50c; El Paso for 63¼c.; Findley for 73c.; Gold Sovereign for 10⅞c.; Portland for $2.10. Isabella has been selling at 25c.; Vindicator at 70c. In the prospect list Banner sold for 5¼c. per share.

San Francisco. Dec. 6.

After a weak opening, the Comstock shares generally acquired a better tone and closed quite firm. Ophir recorded $6 and Consolidated California & Virginia $1.45 at the close.

The Tonopahs were more active, and prices generally good. The market was well supported by buying orders.

Oil shares continue dull and quiet, but there was some buying. Twenty-eight brought $7.75, and Home Oil 45c. today.

Western Australia

The Mines Department reports the gold output in November at 163,249 oz. fine. For the 11 months ending Nov. 30 the total was 1,793,225 oz. fine gold; a decrease of 33,890 oz., or 1.9%, as compared with last year.

Dividends

Company.	Payable.	Rate.	Amt.
Am. Smelting & Ref	Jan. 15	$1 75	$875,000
Am. Smelting & Ref., pfd	Jan. 2	1.75	875,000
Baltic Copper	Dec. 16	7.50	750,000
Bunker Hill & Sullivan	Dec. 5	1.00	300,000
Calumet & Arizona	Dec. 18	2.80	500,000
Calumet & Hecla	Dec. 20	15.00	1,500,000
Copper Range Con	Dec. 23	1.00	383,781
Gen. Chemical, pfd	Jan. 2	1.50	150,000
Granby Con	Jan. 15	0.30	399,981
Greene Con. Copper	Dec. 30	0.40	345,600
Guggenheim Exploration	Jan. 2	1.75	183,750
Iron Silver	Jan. 1	0.20	100,000
Maryland Coal Co	Dec. 30	4.50	84,825
Republic Iron and S., pfd	Jan. 2	3.12½	638,020
Rocco Homestake	Dec. 26	0.02	6,000
Teziutlan Copper	Jan. 1	2.25	180,000
Tonopah Midway	Dec. 15	0.05	50,000

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Brunswick-Chollar	Dec. 30	Jan. 22	$0.03
Bruswick Con. Va	Dec. 28	Jan. 18	0.05
Brunswick-Potosi	Dec. 13	Jan. 2	0.03
Brunswick-Savage	Dec. 12	Jan. 2	0.03
Cedar Creek, Cal	Dec. 24	.....	0.004
Chollar	Dec. 18	Jan. 8	0.10
Con. New York	Dec. 15	Jan. 2	0.03
Dutch Mg., Cal	Dec. 26	.....	0.05
Gould & Curry	Dec. 22	Jan. 10	0.10
Julia Con	Jan. 6	Jan. 29	0.03
Overman	Jan. 3	Jan. 22	0.10
Purington, Cal	Dec. 26	.....	0.01
Segregated Belcher	Dec. 8	Dec. 28	0.05
Spanish Ridge, Cal	Dec. 18	.....	0.05

St. Louis. Dec. 9.

	High.	Low.
Adams	$ .40	$ .25
American Nettie	.18	.15
Center Creek	2.00	1.50
Central Coal & Coke	63.00	61.50
" " " pfd	80.50	78.50
Central Oil	60.00	55.00
Columbia	2.00	.25
Con. Coal	31.00	30.00
Doe Run	200.00	167.00
Granite Bimetallic	.18	.15
St. Joe	23.00	18 50

LONDON. (*By Cable.**) Dec. 12.

	£	s.	d.
Camp Bird	1	8	9
Consolidated Gold Fields	6	0	0
De Beers	17	15	0
Dolores	2	3	6
East Rand	6	8	3
El Oro	1	11	3
Esperanza	5	10	0
Modderfontein	7	8	6
Rand Mines	7	10	0
Rio Tinto	67	7	6
Simmer and Jack	1	10	0
Stratton's Independence	0	6	9
Tomboy	1	6	3

*Furnished by Wm. P. Bonbright & Co., New York.

STOCK QUOTATIONS.

NEW YORK. Week Dec. 13.

Name of Company.	High	Low	Clg.	Sales
*Amalgamated	99	90⅜	98⅛	875,815
Anaconda	193	155	192¾	157,900
British Col. Coppe	8⅞	8⅛	8⅝	14,600
Federal	141	134	140¾	3,300
Federal, Pf	109¼	105¼	108¾	10,000
Greene Copper	29¾	27¾	27⅜	31,500
Greene Gold	4⅜	4	4⅛	5,800
Homestake	82	82	82	130
Mitchell	10¼	8⅞	9⅛	7,040
Ontario	6	4	4	3,305
Tennessee Copper	42½	37	42	17,550
Union Copper	1⅛	1 1/16	1⅞	5,700
United Copper	60	36	60	253,630
United Copper, Pref.	85	78	84⅞	11,554
Utah Apex	8	7¾	7¾	24,010

NEW YORK INDUSTRIALS.

Am. Smelting & Ref	151	150½	160	241,400
Am. Smelting & Ref., Pf.	132⅞	129⅜	133¼	20,500
Colorado Fuel & Iron	52½	46⅝	52⅜	190,500
National Lead	87¾	79	86	153,500
Pittsburg Coal	14⅞	14½	14½	300
Pittsburg Coal, pf	57½	48	48	500
Republic I. & S.	36⅛	33	34¼	140,240
Republic I. & S., Pf	107⅞	104	107	23,500
Tenn. C. & I.	144¾	125⅛	143¾	142,500
U. S. Red. & Ref.	31½	29⅜	31½	2,010
U. S. Red. & Ref., Pf	72	69½	72	4,100
U. S. Steel	39⅜	36⅜	38¾	502,600
U. S. Steel, Pf	106	103½	105½	165,100
Standard Oil	684½	670	683	240
Bethlehem Steel	34½	33	33¼	850

BOSTON.

Allouez	42¾	40½	41¼	4,039
Amalgamated	98¾	91	98½	52,055
Atlantic	25	23½	24	4,760
Bingham	36¾	34	36⅝	9,354
Boston Consolidated	26⅛	23⅛	25⅞	64,080
*Calumet & Hecla	705	678	705	475
†Centennial	31	28¼	30	13,413
Mercur	.62	.59	.62	2,225
*Copper Range	83¾	78¼	81½	73,209
Daly-West	19¼	17¾	18	5,005
Franklin	18⅝	17	17⅜	6,491
Granby	10¼	9⅞	10	3,403
Green Con. Copper	29⅝	27½	29⅛	25,272
Isle Royale	25⅝	23¾	24	8,202
†Mass	10⅝	9¾	10½	2,340
Michigan	18⅜	16¾	17½	12,070
Mohawk	65	63	63	4,867
*North Butte	86	76½	85½	38,500
*Old Dominion	36	33⅛	33¾	6,940
Osceola	111	109½	109	2·885
*Parrot	33½	29	31	10,729
Phoenix	1½	1⅛	1½	245
Rhode Island	6½	5¾	5¾	1,045
Shannon	7¾	7⅛	7¾	4,105
Tamarack	128¼	123	123	833
Tecumseh	13¾	12¼	12¼	1,640
United Copper, com	57½	36	57½	84,555
U. S. Mining	40¾	39	39½	11,865
Utah	58½	55¼	57	21,551
Wolverine	129¾	128	128½	562

PHILADELPHIA.

Cambria Steel	29	28½	28¾	2,712
Philadelphia Co	52¾	52	52½	6,259
Tonopah	14	13⅝	14	1,200

PITTSBURG.

Crucible Steel	13⅝	13¼	13⅝	4,374
Crucible Steel, Pref.	68¾	67⅜	68½	5,905
Tonopah Ext	5.85	5.50	5.70	3,715

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton	47	50¾	46	50
El Paso	61	61	61	61
Isabella	24½	24½	24	24½
Portland	210	210	210	210
Vindicator	70	72	70	70

SAN FRANCISCO.

Best & Belcher	1.40	1.45	1.40	1.40
Bullion	.30	.30	.25	.25
Caledonia	.62	.63	.56	.57
Confidence	.91	.92	.85	.85
Con. Cal. & Va	1.45	1.45	1.35	1.35
Gould & Curry	.18	.19	.15	.15
Hale & Norcross	1.30	1.45	1.20	1.20
Mexican	1.35	1.45	1.35	1.35
Occidental Con	.89	.96	.89	.91
Ophir	5.75	6.12	5.75	6.00
Savage	.59	.59	.54	.54

*Ex-dividend. †1st Installment Paid.
‡Assessment Paid. §2d Installment Paid.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.930
February	57.592	61.023	26.655	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.108
May	55.430	57.832	25.578	26.664
June	55.673	58.428	25.644	26.910
July	58.095	58.915	26.760	27.163
August	57.806	60.259	26.591	27.822
September	57.120	61.695	26.349	28.528
October	57.923	62.034	26.760	28.637
November	58.453	63.849	26.952	29.493
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1904.	1905.	1904.	1905.	1904.	1905.
Jan.	12.410	15.008	12.553	15.128	57.500	68.262
Feb.	12.063	15.011	12.245	15.136	56.500	67.963
March	12.299	15.125	12.551	15.250	57.321	68.174
April	12.923	14.920	13.120	15.045	58.247	67.017
May	12.758	14.627	13.000	14.820	57.321	64.875
June	12.269	14.673	12.399	14.813	56.398	65.881
July	12.380	14.888	12.505	15.005	57.256	66.887
Aug.	12.343	15.664	12.468	15.725	56.952	69.830
Sept.	12.495	15.965	12.620	15.978	57.645	69.667
Oct	12.993	16.279	13.118	16.332	60.012	71.406
Nov.	14.284	16.599	14.456	16.758	65.085	74.727
Dec.	14.661	.....	14.849	.....	66.384	.....
Year.	12.823	.....	12.990	.....	58.587	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	28.845	29.325	July	26.573	31 760
Feb.	28.087	29.262	August	27.012	32.866
Mar.	28.317	29.523	Sept.	27.780	32.095
April	28.132	30.525	Oct	28.596	32.481
May	27.718	30.049	Nov.	29.185	33.443
June	26.325	30.329	Dec.	29.286	.....
			Av., year.	27.986	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	4.347	4.552	July	4.192	4.524
Feb.	4.375	4.450	Aug.	4.111	4.665
Mar.	4.475	4.470	Sept.	4.200	4.850
April	4.475	4.500	Oct	4.200	4.850
May	4.423	4.500	Nov.	4.200	5.200
June	4.496	4.500	Dec.	4.600	.....
			Av., year.	4.309	.....

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'n
	1904.	1905.	1904.	1905.	1905.
January	4.863	6.190	4.673	6.032	25.063
February	4.916	6.139	4.717	5.989	24.594
March	5.057	6.067	4.841	5.917	23.825
April	5.219	5.817	5.038	5.667	23.813
May	5.031	5.434	4.853	5.284	23.594
June	4.760	5.190	4.596	5.040	23.875
July	4.873	5.396	4.723	5.247	23.938
August	4.866	5.706	4.716	5.556	24.675
September	5.046	5.887	4.896	5.737	26.375
October	5.181	6.087	5.033	5.934	28.225
November	5.513	6.145	5.363	5.984	28.500
December	5.872	.....	5.720	.....	.....
Year	5.100	.....	4.931	.....	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Bort as to size	carat	$10.00@$18.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10
Corundum, N. C	"	.07@.10
Chester, Mass	"	.04½@.05
Craigmont, Ont	"	.05½@.06½
Mont. f.o.b. Chicago	"	.07@.07½
Crushed Steel, f.o.b. Pittsburg	"	.05½
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh ton	25.00@35.00
Pumice Stone, Am. Powd.	lb.	.01 3-5@.02
Italian, powdered	"	.01½@.01¾
Lump, per quality	"	.04
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07
ALCOHOL—Grain	gal.	2.38
Refined wood, 95@97%	"	.70@.75
Purified	"	1.25@1.30
ALUM—Lump	100 lb.	1.75
Ground	"	1.85
Chrome Alum	lb.	0.05
ALUMINUM—Sulphate, com'l.	"	75@1.25
AMMONIUM—		
Bromide	lb.	.22
Carbonate	"	.08
Muriate grain	"	.05½@.05¾
Lump	"	.09½
Sulphocyanide com	"	.25
" " chem. pure	"	.35
ARSENIC—White	"	2.95@.04
Red Silesian	"	.07½
ASPHALTUM—		
Barbadoes	"	.02½@.03
Cuban	"	.01½@.03½
Egyptian, crude	"	.06@.07
Gilsonite, Utah ordinary	"	.03@.03½
Trinidad	"	35.00
BARIUM—		
Carb. Lump, 80@90%	sh ton.	25.00@27.00
92@98%	"	28.00@29.00
Powdered 80@90%	lb.	.01½@.02
Chloride com'l	ton.	34.00@36.00
Chem. pure cryst	lb.	.05
Nitrate, powdered, in casks	"	.06
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Crude No 1	sh. ton.	9.75
Crude No. 2	"	8.00
Crude No. 3	"	7.00
Floated	"	16.75@18.00
Foreign floated	"	20.00
Snow-white	"	17.25@18.75
BAUXITE—Ga. or Ala. Mines:		
First grade	lg. ton.	5.25@5.50
Second grade	"	4.50@4.75
Arkansas, first grade	lg. "	5 00@5.50
Second grade	"	4.50@4.75
Washed ore	"	6 00@7 00
BONE ASH	lb.	.02½@.02½
BORAX	"	.07½@.07½
CALCIUM—Acetate, gray	"	2.30
Acetate, brown	"	1.55
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. works	"	9.00@10.00
CEMENT—		
Portland, Am. 500 lb.	bbl.	1.55@1.60
Foreign	"	1.25@1.75
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHLORINE—Liquid		.30
Water		.10
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	18.50@19.00
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	7.75@8.00
Am. best ex-dock, N. Y.	"	9.00@9.25
English, common	"	11.00@11.25
Best		16.75
COBALT—Oxide	lb.	2.60
COPPERAS—Bulk	100 lb.	$0.47½
In bbls	"	.52½
CRYOLITE	lb.	.06½
EXPLOSIVES—		
Blasting powder, A	25-lb. keg	.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	.25
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro	"	.11@.11½
FELDSPAR—Ground	sh. ton.	9.75@10.00
FIRE BRICK.		
American	per M.	20.00@30.00
Imported	"	30.00@45.00
St. Louis No. 1	"	16.00
" No. 2	"	14.00
Extra	"	20.00@23.00
FIRE CLAY.		
St. Louis mill,	per ton	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	sh. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
FULLER'S EARTH—Lump	100 lb.	.80
Powdered	"	.85
GRAPHITE—		
American, ore, common	lb.	.01@.10
Artificial	"	.06
Ceylon, common pulv	"	.02½@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01½@.01½
Best, pulverized	"	.01½@.02
Italian pulverized	"	.01@.02
GYPSUM—Ground	sh. ton.	8.00@8.50
Fertilizer	"	7.00
Rock	lg. ton.	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—		
Ground Am. best	"	20.00
French	"	37.50
German	"	40.00
LEAD—Acetate, white	lb.	.09@.09½
Brown	"	.07@.07½
Nitrate, com'l	"	.06½
" granular	"	.08½
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	6.50@7.00
Calcined	sh. ton.	16.50@17.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01½
Sulphate	100 lb.	.50@1.25
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.01½@.01½
75@85% binoxide	"	.01½@.02½
85@90% binoxide	"	.02½@.03½
90@95% binoxide	"	.03½@.05½
Ore	unit.	.18@.20
MARBLE—Flour	sh. ton.	6.00@7.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide	lb.	.10
NICKEL—		
Oxide, crude, 100 lb. (at 55 for fine metal contained		.35@.40
Sulphate, single	100 lb,	.22@.25
" double	"	.13@.15
OZOKERITE	lb.	11½
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.05½@.06½
English glassmakers'	"	.08½@.08½
Lithophone	"	.03½@.06½
Metallic, brown	sh. ton.	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½
French, washed	"	.01½@.01¾
Paris green, pure, bulk	"	.12
Red lead, American	"	.06½@.06½
Foreign	"	.07@.08½
Turpentine, spirits	gal.	.64
White lead, Am., dry	lb.	.05½@.05½
American, in oil	"	.06½@.06½
Foreign, in oil	"	.09@.09½
Zinc white, Am. extra dry	"	.04½@.04½
Foreign, red seal, dry	"	.06@.08½
Green seal, dry	"	.06½@.09½
POTASSIUM—		
Bicarbonate crystal	lb.	$0 08½
Powdered or granulated	"	.14
Bichromate, Am	"	.08½@.08¾
Scotch	"	.08½@.08½
Bromide	"	.15
Carbonate (80@85%)	"	3.50@4.00
Caustic, ordinary	"	.04½
Elect. (90%)	"	.06½
Chlorate, powdered	"	.11
Crystals	"	.10
Granulated	"	.13
Cyanide (98@99%)	"	.18½@.75
Kainit (bulk)	lg. ton.	8.19
Manure salt 20%	"	14.75@15.50
Double Manure Salt, 48@53%	100 lb.	1.16½@1.19½
Muriate	" "	1.90@1.95
Permanganate	lb.	.09½@.09½
Prussiate, yellow	"	.13½@.13½
Red	"	.35
Sulphate	100 lb.	2.18½@2.21½
SALT—N. Y. com. fine 280 lb. bbl.		.72@1.18
N. Y. agricultural	sh. ton.	4.40
SALTPETER—Crude	100 lb.	4.00@4.25
Refined	"	4.25@4.75
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
Infusorial earth, crude		25.00
Calcined and floated		32.00
SILVER—Nitrate, crystals	oz.	.36½
SODIUM—		
Acetate	lb.	0.04¼
Bicarb., ord., bulk, f.o.b. works	100 lb.	1.30
Extra domes, f.o.b. works	"	3.50
Bichromate	lb.	.06½
Bromide	"	.07
Carbonated ash, high test, in bags, f.o.b., works	100 lb.	.42
Foreign, f.o.b. N. Y.	"	.75@.77½
Caustic, 60@78%, f.o.b., works	"	.85@.87½
Foreign, f.o.b. N. Y.	"	1.75@1.85
Chlorate, com'l	"	1.90@1.95
Cyanide, ("100% KCN")	"	.11
Hyposulphite, Am	"	.18½@.19
German	"	1.50@1.60
Phosphate	lb.	1.75@2.00
Prussiate	"	.02½@.02½
Sal soda, f.o.b. works	100 lb.	.09½@.09½
Foreign, f.o.b. N. Y.	"	.60
Silicate, concentrated	lb.	.85
Com'l	"	.05
Sulphate, com'l	100 lb.	.01
STRONIUM—Nitrate	lb.	.65
SULPHUR—Best seconds, per ton,		.09
Roll	100 lb.	21.00
Flour	" "	1.85
Flowers, sublimed	" "	1.90
		2.20
TALC—North Carolina	sh. ton.	15.50@23.50
N. Y Fibrous best	"	10.25
French, best	"	20.00
Italian, best	"	30.00
TAR—Oil bbl. (50 gal.)	bbl.	5.40
TIN—Bi-chloride, 45%	lb.	.09¼
Crystals	"	.22
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic ch. pure	"	.07@.09½
Chloride solution, com'l	"	.02½
Chloride, granular	"	.04½@.04½
Dust	"	.05½@.05½
Sulphate	"	.02@.02½

The Rare Earths.

BORON—Nitrate	lb.	$1.50
CERIUM—Oxalate	oz.	.35
LITHIUM—Carbonate	"	1.50
LITHIUM—Nitrate	oz.	.60
STRONTIUM—Nitrate	lb.	.07@.07½
TANTALUM—Acid	oz.	.40
Ore, 20% acid	lb.	.20
" 70% "	"	3.50
THORIUM—Nit. 49@50%	"	8.00@10.00
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	10.00

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.